NEW ZEALAND JOURNAL OF Agriculture

MARCH 1948

COMMONWEALTH MYCOLOGICAL INSTITUTE
28 MAY 1948

ONE EXTRA CAN

PRODUCE MORE BUTTERFAT

WHERE BRITAIN STANDS WE STAND

ISSUED BY THE AID FOR BRITAIN NATIONAL COUNCIL

Volume 76
Number 3
March 15,
1948.
(Established 1910)

NEW ZEALAND JOURNAL OF Agriculture

Published by
Direction
of
Hon. E. L. Cullen,
Minister of Agriculture.

This month's cover

The production in New Zealand of every ton of butter possible and the speedy dispatch of produce to the United Kingdom are of paramount importance at a time when the British people are so short of fats. Butter being stacked in a hold of the new Shaw Savill liner Athenic during her first visit to New Zealand is the subject of this month's cover, painted by L. C. Mitchell from a photograph by Photo News Ltd. Of 15,187 tons, the Athenic has 513,320 cubic feet of refrigerated space and can carry in addition 3728 tons of general cargo.

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SUBSCRIPTION RATES

The *Journal* is issued monthly. The subscription within New Zealand is 2s. 6d. a year; the overseas subscription is 5s. The *Journal* may be ordered from any bookseller or newsagent, or direct from any office of the Department of Agriculture. Individual copies are available at 3d. a copy, post free.

REGISTERED AT THE G.P.O., WELLINGTON, AS A MAGAZINE.

STACK PROTECTION

See that stacks are properly protected from rain.

By now haystacks should be well consolidated, and no further adjustments to the weights holding down the covers should be necessary.

Fences surrounding stacks should be inspected for any weak places, because as feed grows short cattle are more inclined to break them down.

A well-protected stack is an insurance against winter feed shortage.

AMPLE WINTER FEED WILL AID PRODUCTION AND THUS ASSIST IN THE VITAL FOOD SUPPLIES FOR BRITAIN

WORLD SHORTAGE OF FOOD SUPPLIES

THAT there is still a most urgent need for increasing food supplies to alleviate a continuing world shortage is clearly indicated in the report of the secretary-general presented to the fourth meeting of the International Emergency Food Council on May 26, 1947, and published by the Food and Agriculture Organisation of United Nations. I have read that report with great interest and feel that all farmers should be aware of the world food position. The following extract gives an excellent summary of the situation:—

"In retrospect, it is apparent that there was a general feeling of optimism over the food phase of world recovery at the time the Council was organised. Everyone was greatly concerned about the shortage of cereals, but the efforts of Canada and the United States of America to alleviate the immediate difficulties were beginning to bear fruit. A bumper United States crop was in prospect and European crops looked much better than those of 1945.

"The prevalent opinion was that most of our difficulties would be over when the 1946 crops were harvested and that those left would certainly disappear with the 1947 harvest. The terminal date of December 31, 1947, was set for concluding the affairs of the Council and provision was even made to terminate the Council's work at an earlier date if supply conditions permitted. Indeed, there was a strong undercurrent of belief that the big problem of the near future would be that of post-war surpluses.

"Today it is apparent that the optimism of a year ago was largely unwarranted. True, a very considerable number of commodities have been dropped from the purview of the Council, but the hard core of the problem still remains. Cereals, rice, fats and oils, sugar, meat, pulses—which in the aggregate furnish over 75 per cent. of the caloric intake of the world's population—all are in seriously to critically short supply. . . .

"In brief, the recovery in food supplies that we expected a year ago has not taken place; nor will such recovery come about in the next twelve months. What was amiss in the reasoning that led to the expectations that were held in 1946?

"It seems to me that the biggest error was the assumption that World War II was an approximate duplicate of World War I and the consequent conclusion that the subsequent course of events would follow the same pattern.

" . . . World War II was really a world war, which World War I was not. If World War I had any effect in the Far East, it was to dam up food supplies which flowed on to the market as soon as shipping became available. But this time much of the Far East was an active and prolonged theatre of war with all the adverse consequences thereof. Moreover, even in Europe a great deal more territory was involved this time and the destruction was many times greater. . . .

"Because of the incorrect analogy between the two post-war situations, fairly quick food recovery has been taken too much for granted. As a consequence we have not properly husbanded our available supplies, as witness the current cereals crisis. We have not devoted sufficient energy and resources to rehabilitating food production because we assumed the recovery would be automatic and immediate, as it was in 1920 and 1921. We have not correctly evaluated the effects which the widespread social and political changes that followed in the wake of this war have had on food output and exports.

"As a result the world finds itself—two years after the end of the war—with an end-of-season deficit of well over a million tons in the quantity of cereals needed to maintain current rations and minimum working stocks; with export supplies of fats and oils only 60 per cent. of pre-war, and of rice less than 30 per cent. of pre-war; with the world's sugar production, though higher than the post-war low, still more than 10 per cent. lower than pre-war; with meat production down 8 to 10 per cent. for the world generally and 40 per cent. for Europe. In addition, there are smaller supplies of many other foods, but 5 to 10 per cent. more people to be fed. . . .

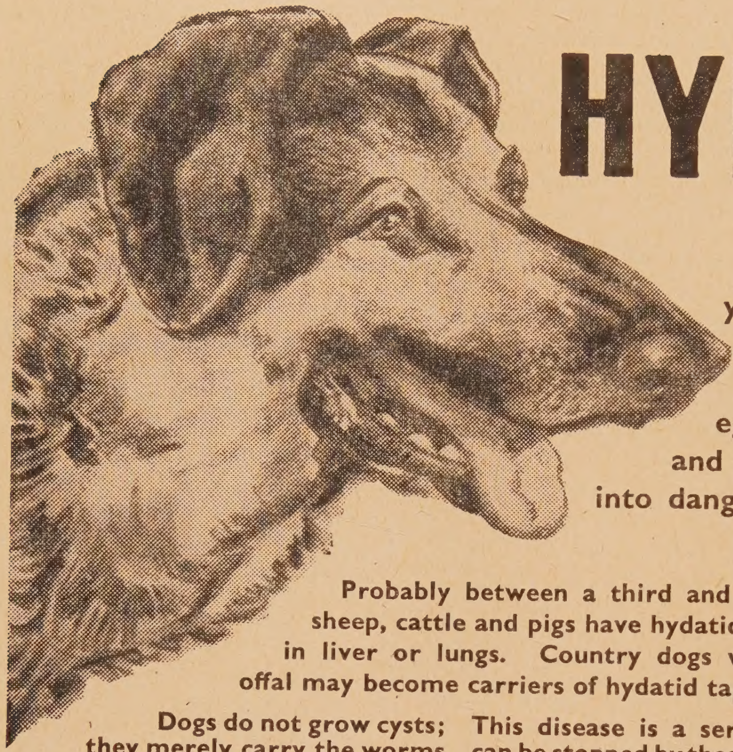
"Only exceptionally large food production in North America, together with some surplus stocks of cereals which Canada and the United States had on hand at the end of the war, has prevented the world situation from becoming completely intolerable. In one respect even this has not been an unmixed blessing. To buy this food, especially the record volume of cereals, has taken scarce dollar exchange—dollar exchange which would have been used for the purchase of the materials and equipment for general economic rehabilitation if the need for buying imported food to supplement short crops at home and to maintain a minimum ration for urban consumers had not taken precedence."

I have already referred to the disappointing position revealed in estimates of areas sown in cereals for threshing for the 1947-48 season and of the importance of reaching the targets set for 1948-49. It is clear that New Zealand must aim for a balance in her primary production, as recommended by the Aid for Britain National Council, and thus play her full part in aiding world recovery.

The secretary-general of the International Emergency Food Council has sounded a warning note. Our duty as an important producer of food is clear.

EDWARD CULLEN, Minister of Agriculture.

How your dogs can spread HYDATIDS



Dogs are our faithful friends, yet about 50,000 country dogs in New Zealand are infected with Hydatid tapeworms whose tiny eggs are passed on to human beings and stock animals and may develop into dangerous cysts.

Probably between a third and a half of our sheep, cattle and pigs have hydatid cysts, usually in liver or lungs. Country dogs which feed on offal may become carriers of hydatid tapeworms.

Dogs do not grow cysts; they merely carry the worms whose eggs are scattered by the million in their droppings. These droppings dry, crumble, and the eggs are blown about as dust. This dust gets on to pastures and infects sheep and cattle, and on to the coats of dogs, and so on to human hands.

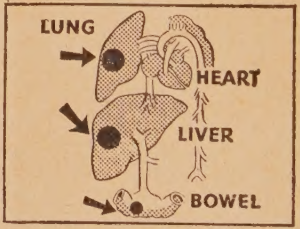
These invisible eggs may thus get into the system, burrow through intestine walls into the bloodstream and so to liver, lungs, and even to heart and brain, where they may grow for years into dangerous cysts that can only be removed by operation.

This disease is a serious one, and can be stopped by these precautions:

- After handling animals, never put hand to mouth without washing. Children should wash hands before every meal.
- Wash carefully all vegetables eaten raw.
- Never throw raw liver or lungs of sheep to dogs. Cut offal into slices and boil first. Otherwise burn or bury it.
- Dose your dogs with a vermifuge every three months and expel the worms. Arecoline is supplied for this purpose; it can be obtained with your dog licence.

Dog eats raw offal, becomes infected with hydatid worm.

Invisible eggs from dog's dusty coat get on to child's hand and thence to mouth.



Eggs may lodge in human body for years, grow into large cyst.

DOSE YOUR DOGS REGULARLY

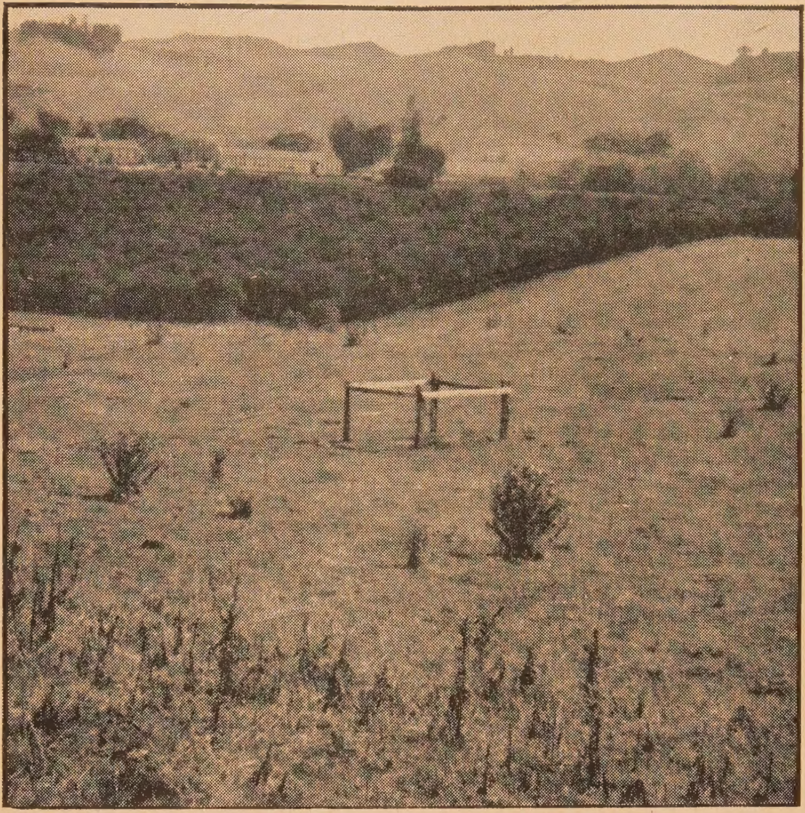
Don't feed them raw offal!

Weed Seeds in Grass Seed can be Avoided

Precautions to Take

By E. R. MARRYATT,
Fields Instructor, Whakatane.

ALLEGATIONS have recently been made that noxious weeds are coming into the Whakatane district in grass seed from other districts. Some allegations have gone even further and have laid the blame on Government Certified seed. Requests for lectures on the subject have been received from farmers' organisations, but these addresses have reached only a small number of farmers. This article discusses reasons for such complaints and details the precautions available to farmers for avoiding the introduction of weeds in seeds.



This land was sown with a mixture containing uncertified seed, which included winged and Californian thistle.

THE plain fact is that any farmer who buys grass or other seed containing the seeds of troublesome weeds has only himself to blame. He should know exactly what he is buying before he buys it. The information is available for the asking. First, the merchant has an official purity and germination certificate for each line of Certified seed and he will produce this on request; second, should the farmer so desire, the merchant will allow him to take his own sample for official testing.

Government Certification Scheme

Before being accepted for certification a seed crop must first pass a field inspection undertaken by an officer of the Fields Division. If rejected from certification, the crop will still be harvested and sold to the buyer who knows no better than to use uncertified seed. If accepted for certification, the bags of seed are sealed and branded in the field by an officer of the Fields Division. These seals are broken only for machine dressing of the line, and then the bags are again sealed by an officer of the Fields Division and remain sealed until opened by the ultimate buyer. Tags bearing the identification number of the line of seed are also attached to the sacks. Lines may be split under the supervision of a Fields Division officer, who again seals and tags the split bags.

The origin of Certified seed can always be traced by the identification numbers appearing on the certification tags. Uncertified seed comes from anywhere, including fields which were of too low a standard and were rejected from certification.

All lines of Government Certified seed are sampled by a departmental officer, these samples forming the bases of purity and germination certificates issued by the Seed-testing Station. The certificate carries the same identification numbers as the tags on the sacks of seed it covers, and every farmer should make it his business to study the certificate before buying any line of seed, on the same principle as he would study the records of dairy stock before deciding on purchase. If he does not understand any part of the certificate, the merchant will explain it or he can apply to his local officer of the Fields Division. Government Certified seed must reach certain standards of purity after having been machine dressed, but these are only minimum standards and do not exclude any specific weed seeds.

The farmer can protect himself against the presence in his grass and clover seed of weed seeds which might be troublesome on his farm if he takes care to inspect the purity and germination certificate before he buys his seed.

A facsimile of the certificate of analysis (or purity and germination certificate) for samples submitted by merchants and growers was featured on page 84 of the January, 1947, issue of the "Journal." The certificate of analysis covering officially-drawn samples of Government Certified seed differs in the following respects: The particulars on the top-left-hand side include also the certification class of the seed and the registered number of the line; the endorsement that the analysis refers only to the sample submitted does not appear.

A "Cheap" Grass Seed Mixture

Here is an advertisement which lured at least one farmer into buying:—

> "**Special Grass Seed Mixture:** Nicely-balanced mixture for autumn sowing, embracing seed of high germination and purity including Mother, permanent pasture, and Certified seed, Italian and perennial ryegrass, cocksfoot, cowgrass, red, white, subterranean, and Montgomery red clovers, browntop, timothy, crested dogstail, etc. 92s. 6d. per sack."

WEED SEEDS IN GRASS SEED

Left—Government Certified seeds only were sown to produce this good pasture. Right—The cheap seeds mixture sown here contained a large variety of weeds and cannot be regarded as anything but a bad investment.

The advertisement notably neglects to mention which and how few of the seeds have the "high germination and purity" and what "etc." covers. The attractive picture it draws is in considerable contrast to the advisory letter received by the farmer after his seed mixture had been tested, an extract from which reads:—

Crop	Pure seed (per cent.)	Germination (per cent.)	Hard (per cent.)	Abnormal (per cent.)
Ryegrass ..	54.3	58	—	2 (trace of Italian blood)
Crested dogstail	8.1	60	—	—
White clover	9.1	58	17	2
Red clover	3.4	55	4	7
Suckling clover ..	3.0	53	39	5
Cocksfoot	1.3	90	—	—

"**Other crop seeds:** 1.1 per cent., including redtop, browntop, several fescues, timothy, black medick, alsike clover, danthonia, *Poa pratensis*, and paspalum."

"**Inert matter:** 13.2 per cent., mainly empty cocksfoot glumes, straw, broken and germinated clover seed, and ergot."

"**Weed seeds:** 6.5 per cent., including ribgrass 1.5 per cent., hairgrass 1.0 per cent., and sheep's sorrel 1.0 per cent., with traces of Yorkshire fog, sweet vernal, curled dock, goosegrass, hawkweed, field madder, Australian flax, *Poa annua*, broad-leaved dock, catsear, lesser hawkbit, Scotch thistle, self-heal, scarlet pimpernel, stinking mayweed, catchfly, mouse-eared chickweed, small-flowered buttercup, clustered clover, hairy buttercup, spurry, and speedwell."

"This mixture is typical of the allegedly 'cheap' seeds mixtures which so often appear attractive when advertised. Lines such as these, with their low purity and germination, can never be regarded as a good investment."

A "Bush-burn" Mixture

A returned serviceman who intended buying a line of "bush-burn" seed mixture first took the precaution of having it tested. This is the report he received:—

Variety of seed	Percentage present in mixture	Germination (per cent.)
Ryegrass ..	55.9	50
Crested dogstail	15.4	28
White clover	12.1	26 + 15% hard seed
Suckling clover	3.3	29 + 10% hard seed
Timothy ..	2	17
Cocksfoot ..	1.1	54

"You will note that the seed is of poor germination and in addition contains 7.2 per cent. of inert matter and 2 per cent. of weeds. These weeds include 8 seeds per ounce (of the bulk) of Californian thistle."

Free Advisory Service

The Department of Agriculture gives a free advisory seed-testing service to farmers. A farmer may send in a sample of seed to the Seed-testing Station at Palmerston North at any time and will receive in return a report on purity, germination, and strain in language readily understandable by practical men. The common names of weeds, grasses, and other plants are used in all these reports to farmers and emphasis is placed on the germination capacity and weed seed content.

Those trading in seeds are charged a small fee for certificates of analysis, and these conform to the rules laid down by the International Seed-testing Association, which requires that the scientific names for plants be used. That is necessary because common names of plants unfortunately are so common that they are often given to different plants in different districts of the same country, and sometimes even to different plants in the same district. An example of the confusion which may arise from the use of common names occurs with the weed *Coronopus didymus*, which causes much trouble and considerable financial loss through giving a "cress" flavour to cream and butter in some districts. This weed is known as "twin cress," which is the most suitable common name because of the twin-like seeds, but it is also called "cress," "hogcress," "wartcress," "landcress," "swinecress," and "scurvy grass." Unfortunately there are other cresses and some of them are also known by these names. Some are troublesome weeds and others are not, so it is very important to identify correctly the cress concerned, and that can be done with certainty only by using the Latin name of botanical classification. In addition, many certificates are sent overseas accompanying seed exported, and the scientific name is the only one which identifies the same plant in every country.

To assist in the interpretation of certificates a list of both the botanical and common names of the more frequent impurities will be furnished by the Seed-testing Station at Palmerston North on request.

Business-like Methods Required

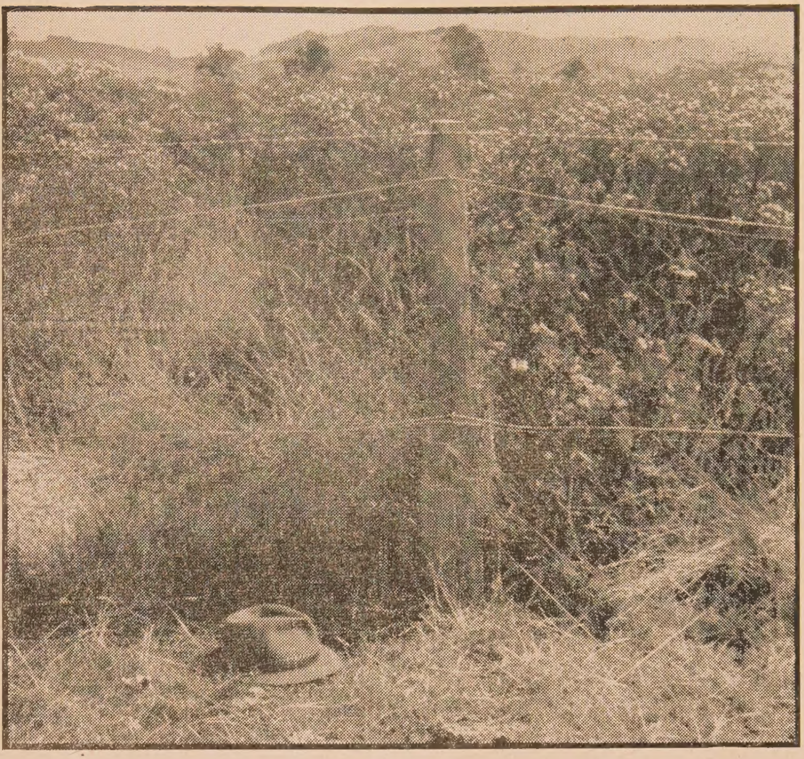
Seed merchants would not remain long in business if they did not give full attention to the information contained in purity and germination certificates, for what other accurate basis have they for deciding the market value of seed? Progressive farmers also make use of all available information, but the "cheap seed" merchant will continue in business as long as credulous farmers accept his own valuation of his product and do not check up on the facts by having their own samples analysed. Though he persuades many that he is, the "cheap seed" merchant is not a philanthropist.

When a sample of seed is sent to the Seed-testing Station a report cannot be expected by return mail. Samples for germination capacity should be sent at least a month to six weeks, and preferably longer, before purchase of the seed is necessary. Seeds take two to three weeks to germinate and the making of reports and mailing both ways also occupy time. Obviously, the farmer who thinks about buying his seed only when he is almost ready to sow can make no use of the Government's free advisory seed-testing service. Business-like methods are as necessary in buying seeds as in buying herd replacements. Seed can be bought from reputable firms subject to a satisfactory purity and germination report, and there is then no danger of the seed under test being sold before the report arrives.

Other Ways Weeds Increase

Blame for the importation and increase of troublesome weeds into hitherto relatively-clean districts could more truthfully be laid partly on sheep in transit (for example, that was probably how winged thistle (*Carduus pycnocephalus*) was introduced into the Bay of Plenty); partly on neglect of the first generation of weeds, and insufficient control of all generations; on wind transport of seeds; and least of all on their purchase in grass and other seeds.

The importance of seed quality in pasture establishment is widely appreciated, as is shown by the number of requests received for advice on seeds mixtures and related subjects, but many farmers still buy without knowing what they are buying and sow without considering the germination capacity in relation to the rate of sowing, the strain in relation to the purpose of the pasture, and the weed seed content in relation to the type of farming.



Neglect is one of the main causes of increase of some weeds.

Some kinds of weed seeds—for example ragwort—are mainly wind borne.

Precautions

Here are some steps which every farmer should take before buying grass seed:—

1. Investigate the market early—at least six weeks before the time of sowing.

2. Ask for the purity and germination certificates covering the lines of seed being considered.

3. Compare the purity and germination number on the certificate of analysis covering Certified seed with the numbers on the tags attached to the sacks of seed.

4. Where desirable, send his own sample for analysis.

5. Base buying on purity, germination, and strain.

6. See that sacks of Certified seed are properly sealed—that there are no unsealed knots in the sewing twine and no holes in the sacks.

7. When in doubt, consult the local Fields Division officer.

WHEAT GROWERS' AID FOR BRITAIN

A PLEDGE to form groups which would work assiduously for the "Grow More Wheat" campaign in their districts was given by farmers and others associated with wheat growing and milling at meetings held throughout the wheat-growing areas of the South Island in January and February during a tour by the chairman of the Aid for Britain National Council, Mr. F. P. Walsh. He was accompanied throughout by the general secretary of Federated Farmers of New Zealand, Mr. A. P. O'Shea, and in the southern districts by the Acting Director-General of Agriculture, Mr. R. B. Tennent.

THE tour extended from Lumsden and Gore in Southland to Cheviot and Culverden in North Canterbury and included many centres in South Otago, Central Otago, North Otago, South Canterbury, Mid-Canterbury, and North Canterbury. Tours in the North Island wheat-growing districts will complete the plan of organisation in the near future. The meetings were some of the most widely representative ever held in connection with a wheat appeal. Their object was to emphasise to farmers the seriousness of the position and to discuss every problem confronting the growers.

In reply to assurances given by farmers and others associated with wheat growing, Mr. Walsh gave an assurance that the Aid for Britain National Council would do all in its power to see that the main problems were tackled urgently and sympathetically. Many of them, he pointed out, had already been the subject of urgent attention and action.

Industry's Plan of Assistance

The plan of assistance promised by all sections of the industry in Canterbury is as follows:—

All stock and station firms are directing their field men to seek more wheat planting this autumn.

All wheat brokers are to conduct personal canvasses of the farming districts asking farmers to grow more wheat.

Officers of the Fields Division of the Department of Agriculture throughout Canterbury met in Christchurch to discuss the campaign and are now back in the field doing everything possible to assist the campaign.

Branches of Federated Farmers throughout Canterbury are organising campaign committees and have pledged themselves to use all the influence in their power to achieve increased wheat acreages.

The millers' organisation is organising direct contact with growers and prospective growers.

Implement importers, in association with the Canterbury Chamber of Commerce, are arranging a personal canvass of farmers. Part of the scheme is already launched.

United Wheatgrowers, through "The Wheatgrower," will be concentrating on sending to farmers monthly all information that will assist the securing of increased acreages.

As a result of new transport arrangements announced by the Minister of Transport a special effort is being made by all transport interests to ensure that this season's harvest is lifted from farms with the utmost expedition. Plans are also laid for early organisation in preparation for lifting the hope-for increased harvest of 1948-49.

Special efforts are to be made to deal urgently with the manure and lime position.

A recommendation is to be made to the Prime Minister that the Public Works Department and State Forest Service be asked to consider the possibility of releasing labour during harvesting operations.

The Reserve Bank has undertaken to examine any instance brought to its notice concerning wheat growers' financial considerations should they be affected by some local interpretation of the policy announcement of the Reserve Bank.

Transport

Of the problems discussed at the series of meetings attended by Mr. Walsh and Mr. O'Shea the question of transport was given most attention, and as a result of Mr. Walsh's taking the matter up with the Prime Minister the Commissioner of Transport, Mr. G. L. Laurenson, visited Canterbury. After a conference of all parties concerned with transport, decisions were reached by which it is hoped to effect considerable improvement in the transport position.

A statement issued on January 23 by the Minister of Transport, Mr. Hackett, included the following:—

"Any public carrier will be granted a temporary licence to transport wheat direct from a farm to a flour mill, outside the terms of his licence, in excess of 30 miles or alongside rail, if rail wagons are not readily available.

"Any farmer who wishes to transport his neighbour's wheat and make a charge will also be granted a temporary licence where rail or public road transport cannot do the job. (Applications for temporary licences should be made to the District Officer, Transport Department, Christchurch.)

"Road transport vehicles will be used to the maximum possible extent in the whole of the wheat-growing area for transport of wheat to flour mills where rail wagons are not available," said the Minister. As a result of inquiries by the Commissioner of Transport, said the Minister, he was satisfied that the transport of wheat from farms to mills would be facilitated if extra flexibility were given to road vehicles. On the other hand he was also satisfied that the lifting of all restrictions on transport of wheat by road vehicles would result in confusion and the disruption of transport of other essential commodities.

Of Vital Importance

"The vital importance of the local growing of wheat to New Zealand and to the British Empire cannot be stressed too strongly," concluded the Minister, "and I am anxious to do everything in my power to encourage farmers to extend their activities in this direction."

Further discussions are to take place with the Railways and Transport Departments to examine the success of measures for this season and to plan for efficient lifting of the much greater harvest expected in 1948-49.

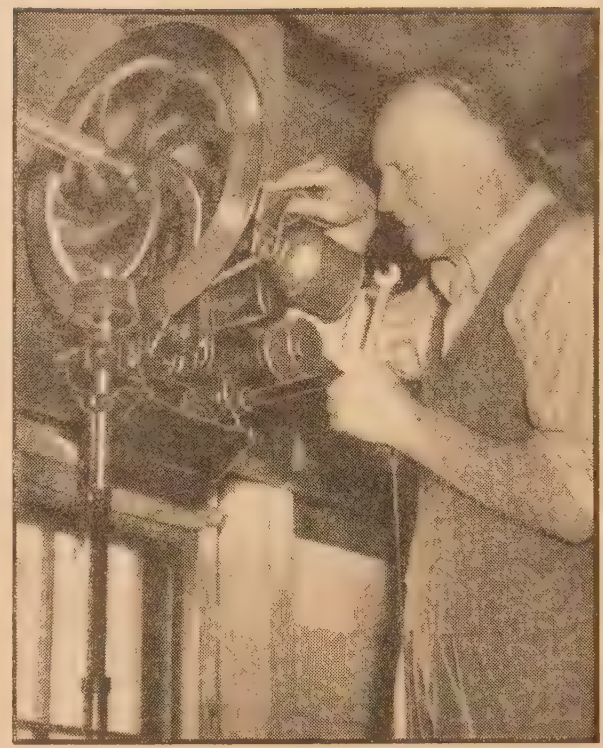
Other problems being reviewed with the appropriate authorities are domestic help for farmers' wives during the harvest period; suggested relief from f.o.b. charges for wheat growers in outlying districts; securing of priority arrangements where urgent repairs are required to farm machinery; and consideration of factors arising from high moisture content in the wheat of certain districts in the far south. A host of minor points is also under consideration.

Throughout Mr. Walsh's tour thanks were expressed to the council for its practical and forthright approach to the campaign and for the results already achieved in settlement of some of the extremely-urgent problems, notably transport and implements. Mr. Walsh expressed the council's appreciation of the efforts of representatives of various sections of the industry for their work on behalf of the campaign. He made particular mention of the work of Mr. O'Shea and his district secretaries, of the co-operation received from the Wheat and Flour Controller, Mr. R. McPherson, and of the combined efforts of Department of Agriculture staff in all districts.

LUBRICATION

By H. W. T. EGGERS, *Farm Engineer, Wellington.*

ON the efficiency of farm machinery depends to a great extent the effort of the farmer to raise production to meet Britain's requirements in foodstuffs from New Zealand. Machinery maintenance is most important, and this article describes a fundamental in care of equipment—lubrication.


[*Sparrow Industrial Pictures Ltd. photo.*

IN modern machinery friction tends to retard movement between rubbing surfaces and the expenditure of energy is required to overcome it. Because lubrication tends to reduce friction it releases energy which would otherwise be lost and makes it available for useful work. Friction between two rubbing surfaces can be reduced if they are made smooth, but this in itself is not sufficient, and to make them slippery the introduction of a lubricant is required. The action of a lubricant is actually to separate the rubbing surfaces and interpose itself. Oil interposes between surfaces a layer of globules which takes up a rolling action between the surfaces similar to a ball-bearing, thus reducing the surface friction (Diagram 1).

It has been established that mineral oil and grease (fat) possess characteristics best suited for general machinery lubrication. For special applications mineral oil may be compounded with vegetable or even animal oils, or the last two may be used on their own, depending entirely on their suitability for the particular application.

Grades

Any oil or grease can be used to reduce friction between two rubbing surfaces, but to produce the maximum effect the oil must be of the correct type and grade.

The question of lubrication is under constant study by experts, and with each piece of machinery produced the manufacturer issues the recommendation of the experts as to the correct type and grade of lubricant to be used for each moving part. If these recommendations are followed, the useful life of the machine will be increased to the maximum and the wear on moving parts reduced to a minimum.

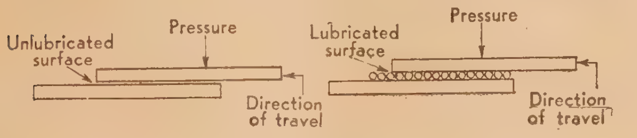


Diagram 1.

It may be asked, "Why is a different grade of lubricant necessary for different parts of the same machine; surely oil, as such, will lubricate wherever it is used?"

This may be true, but what sort of lubrication will result?

Mineral lubricating oils and greases are graded and blended to suit the work for which they are designed, with gradings from light to heavy.

At first each oil producer had his own grading for his products, but later, for convenience, all gradings were reduced to a numbered standard ranging from low values for light oils to high values for heavy oils. This grading is known as "Standard American Engineers" rating and is designated S.A.E. followed by the grading number such as 10, 20, 30.

It should be understood that this grading applies to the viscosity of the oil only and is no indication of quality.

Friction between two rubbing surfaces is proportional to the pressure between them. (A horse can draw an unladen sledge easily, but loading the sledge with stones increases the horse's difficulty in moving it, owing to the increase in friction between the sledge and the ground produced by the weight of stones. As the load is decreased the horse has to exert less force to overcome the friction and draw the load.) The existence of varying pressures between different rubbing surfaces is one reason why oils of different grade are necessary.

Lubrication depends on the rolling action of oil globules and if a light oil is used between surfaces with a high bearing pressure, globules are not strong enough to retain spherical form and are pressed oval, losing their rolling action and soon breaking down (Diagram 2).

In gearing, the pressure is between the faces of the teeth, and the lubricant must be neither too heavy nor too light, but should flow readily between the gear teeth and cling to them, providing a cushion of oil globules where these are needed (Diagram 3).

Heat is the second factor which makes different grades of lubricant necessary. Oil when heated tends to thin out and is not as capable of withstanding high pressure without breaking down. Producers refine and blend oils specially adapted to high-pressure working.

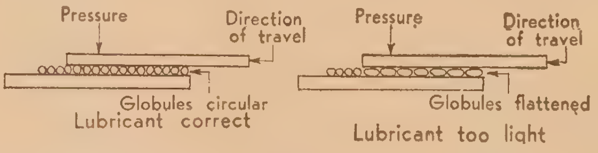


Diagram 2.

Lubricating oils and greases are blended and refined to meet all requirements of modern machinery, and lubrication should be carried out at the times stated and with the lubricants recommended by manufacturers.

Methods of Lubrication

The methods of lubrication may be grouped as follows:—

Oil Lubrication

(a) Forced feed, in which the oil is pumped and fed to the rubbing surfaces under pressure; e.g., engine crankshaft bearings, both main and crank-pin.

(b) Splash, where the rubbing surfaces are splashed with oil when exposed; e.g., engine cylinder walls splashed with oil thrown out by crank-pin bearings.

(c) Dip, where the moving part dips into an oil bath at regular intervals; e.g., crank-pin bearing of some engines. This type is usually provided with a scoop to pick up the oil.

(d) Oil bath, where the moving parts are in constant contact with a lubricant bath; e.g., gear boxes, roller chain drives, worm gears, etc.

(e) Wick feed, where the lubricant is contained in a receptacle and a worsted siphon provided to lift the oil into the oilway; e.g., main bearings of stationary horizontal engines.

(f) Ring oiling, where a ring larger in diameter than the moving part is placed over the part in such a way that it revolves with it. The lower side of the ring is immersed in an oil bath and oil is carried up to the moving part; e.g., pedestal bearings on countershaft drives.

(g) Other means, such as sight feed cups and even the conventional oil can.

Grease Lubrication

(a) Screw-down grease cups, where pressure is applied to force grease between the moving parts by screwing together the two halves of the grease container.

(b) Grease packing, where moving parts are packed with grease at the maker's works.

(c) Grease nipples, where pressure is applied to the grease with a grease gun fitted to the nipple.

Care

To ensure efficient lubrication it is not only necessary to use the correct type and grade of lubricant, but the parts for conveying the lubricant to the rubbing surfaces must be kept in good working order. The same care must be given to the lubricant itself. Dirt and grit are abrasives and, if present in a lubricant, will cause damage.

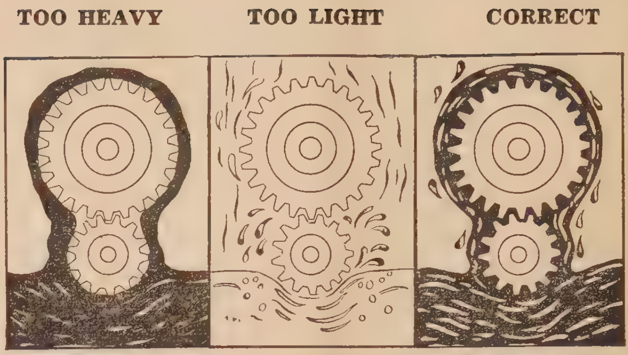


Diagram 3, showing necessity for correct grade of lubricant, which should flow easily between gear teeth and cling to them.

Keep the lubricant clean, from the suppliers' container to the rubbing surfaces.

Wipe dust off grease nipples before applying the grease gun.

Clean oil holes before applying the oil can.

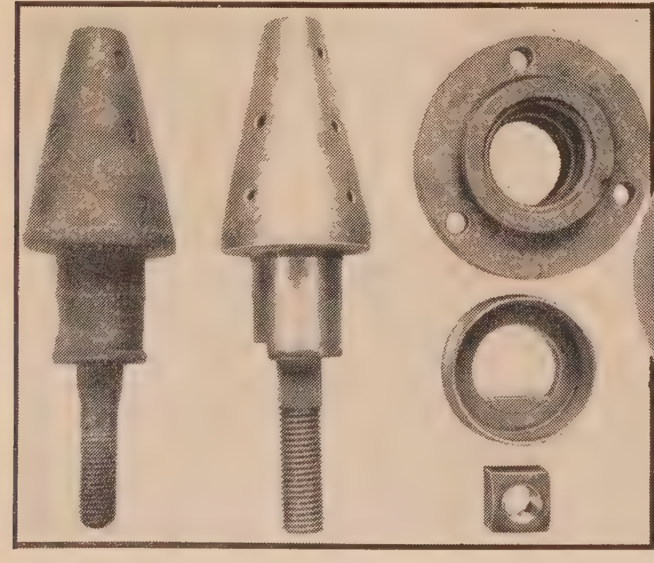
Use stoppers in open oil holes.

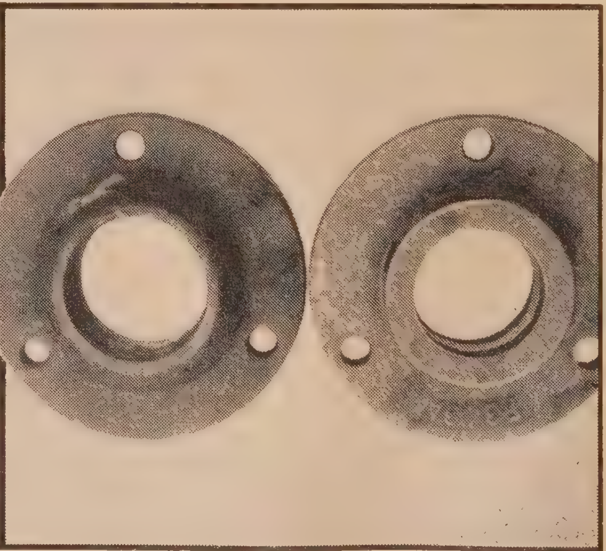
Case of Neglect

To indicate the results of neglecting correct lubrication, facts relating to a damaged tractor plough are quoted.

Figs. 1 to 5 are photographs of the furrow wheel (and parts) of the tractor plough. The machine apparently had an accident in the field and, owing to unsatisfactory repairs and neglect of the essentials of lubrication, excessive wear resulted. The parts were returned to the makers for repair, but were scrapped as being not worth attention and a completely new set was supplied. The high cost of new parts could have been avoided with the exercise of sufficient care.

Fig. 1 shows the stub axle. From left to right: Worn stub axle, new stub axle, back plate (with oil seal inside), sand washer, and nut. In the new axle the cone part is

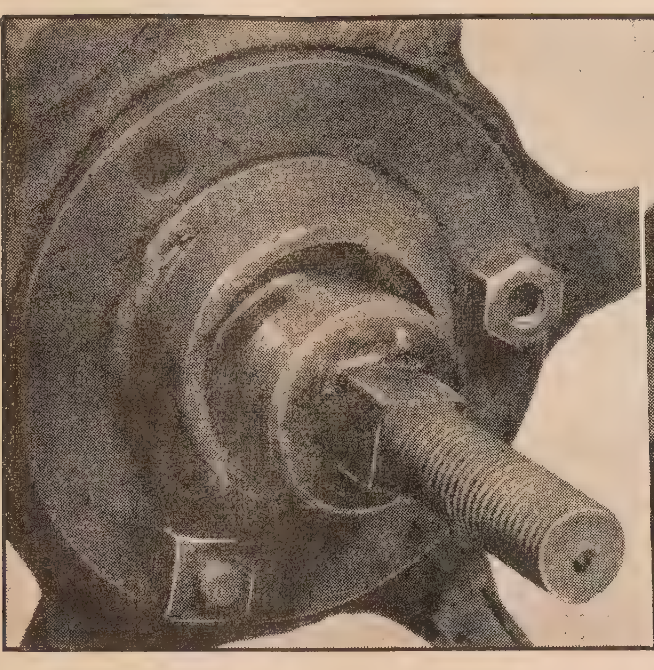


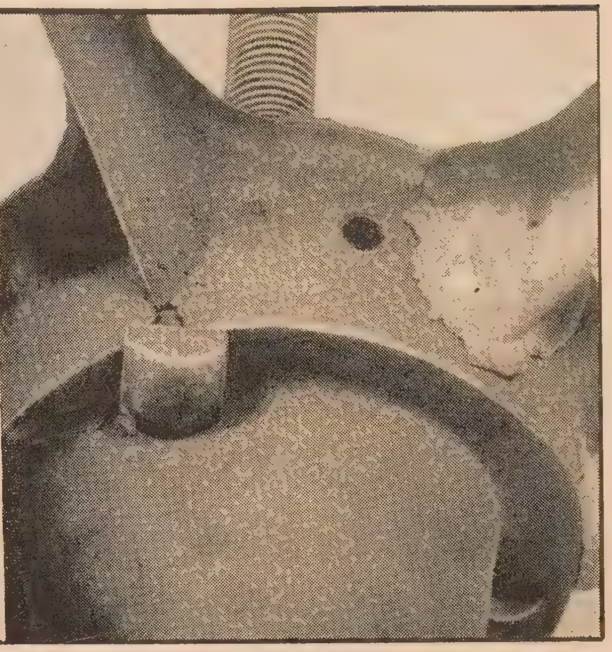


[*Green and Hahn Ltd. photos.*

Fig. 1 (left)—Left to right: Worn stub axle, new stub axle, back plate (with oil seal inside), sand washer, and nut.
Fig. 2 (right)—Worn back plate (left) and new plate (right).

CASE OF NEGLECT OF LUBRICATION





[Green and Hahn Ltd. photos.

Fig. 3 (left)—Stub axle inside the boss of the wheel. Fig. 4 (right)—Boss of the wheel and oil hole.

hollow, to act as an oil reservoir, the oil holes are clear, and the surface is clean and shiny, while in the old axle excessive wear is apparent on the bearing surface below the cone, with a ridge formed by the groove in the back plate after the oil seal had been destroyed. Oil holes from the reservoir are blocked with dirt, and dirt and mud adhere to the surface of the cone.

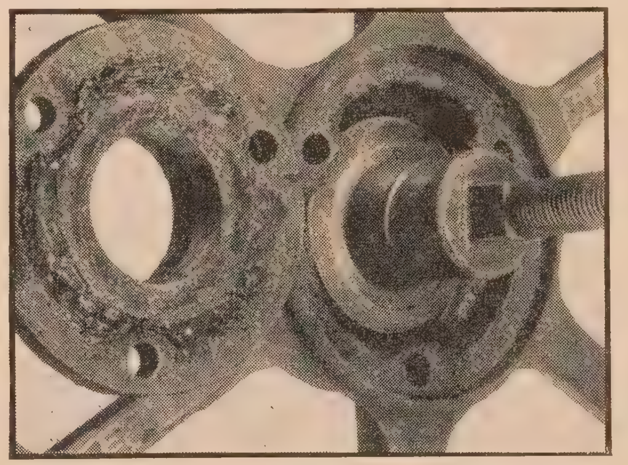
Fig. 2 shows the worn back plate (left) and a new plate (right). The oil seal in the new plate has been worn completely out of the old plate. The difference in diameter of the centre hole indicates the amount of wear.

Fig. 3 shows the stub axle inside the boss of the wheel. The wear on back plate and axle can be seen. One bolt is missing and the square nut on the other bolt cannot tighten the bolt sufficiently, because the corners contact the back plate before the bolt is tight. This leaves the back plate with only one effective bolt, which would be insufficient, even with new parts, to hold the plate oil-tight against the boss.

Fig. 4 shows the boss of the wheel and oil hole. The hole is not plugged, though it is threaded to accommodate a screwed plug. This illustration also shows the unsatisfactory repairs. Spokes, broken in the field, were brazed on again, but a hole was left beside the bolt head. This would allow oil to drain out even if one bolt had not been missing and even if the other were tight.

Fig. 5 shows the back plate removed and reveals the use of improper lubricant. Grease has been used in a bearing designed for oil. (The stub axle has an oil reservoir —Fig. 1) Grease is caked on the back plate and round the inside of the hub, well removed from the bearing surface of the stub axle. When the hub ceased to retain oil, because of leaks through a hole, missing and loose bolts, and a worn oil seal, grease was applied in the hope that lubrication would be achieved. The only effect was that the grease was packed round the walls of the recess and gave no lubrication to the bearing surfaces.

The facts given show what leads to the scrapping of a valuable part which could have been saved by a little timely attention.



[Green and Hahn Ltd. photo.

Fig. 5—Back plate, revealing improper use of lubricant.

Points to Remember

1. Lubrication saves energy.
2. Correct lubrication ensures a maximum life of wearing parts.
3. Do not expect a lubricant to work beyond its capacity. Use the correct grade.
4. Mineral oil injures rubber. Use the correct vegetable oil or a compounded oil if rubber is affected.
5. Mineral oil is damaging to electrical insulation. Too much lubrication of electrical machinery can be as harmful as too little.
6. Cleanliness is essential.

Aims and Organisation of the Federation of Young Farmers' Clubs

YOUNG Farmers' Clubs throughout New Zealand are holding their annual meetings this month, to be followed by annual meetings of the district committees in April and of the four councils in May, preparatory to the annual general meeting of the federation, which usually takes place toward the end of June. This article reviews the constitution of the democratic system of clubs comprising the Y.F.C. movement. The organisation is entirely self-governing, but much of its success and progress is the result of the assistance and guidance given by the Department of Agriculture, whose officers act in an advisory capacity.

IN general, the aims of the organisation may be summed up in a few words: The fostering of a spirit of leadership and self-reliance among the youth of the rural community; the promotion of agricultural education and the encouragement of social activities throughout the country districts; and the development of interest in the well-being and advancement of farming generally.

Aiming broadly at making better farmers and better citizens, the movement commands, or should command, the good will and sympathy of all who have the welfare of the country at heart. The movement is non-political and nonsectarian; party-political or sectarian subjects are prohibited at club meetings.

Units of the Federation

The duties of the Dominion executive committee broadly lie in the direction of the movement's general policy. The committee consists of the president, vice-president, and immediate past president of the federation, delegates from councils, and representatives of the Department of Agriculture, the agricultural colleges, and farmers' organisations. Meetings are held periodically—usually every three months—in Christchurch and Wellington alternately.

The four councils, Otago-Southland, Canterbury, Wellington, and Auckland, have jurisdiction over the areas under the control of each of the four Fields Superintendents of the Department of Agriculture. A council consists of delegates from each district committee, the Fields Superintendent, such coopted members as are desired, and a secretary, who is an officer of the Fields Division. Office bearers are elected at the annual meeting of the council, which takes place in May each year. The main functions of a council are to co-ordinate the work of its district committees, make recommendations to the Dominion executive committee, and generally carry out the policy of the executive.

District committees consist of delegates from clubs, from which the committees' office bearers are elected, with the exception of the secretaries, who, as in councils, are officers of the Department of Agriculture. The annual meetings of district committees are held in April each year, and the committees' duties include the co-ordination of the work of the clubs within their districts, the arrangement of district field days, tours, demonstrations, competitions, and other activities, and the implementation of federation policy. For the purposes of the organisation a district comprises the area assigned to an instructor of the Fields Division of the Department.

Club Organisation

Each club consists of a senior advisory member—an older member of the community willing and able to attend meetings and generally assist in the guidance and control of club affairs and policy—and not more than two other advisory members; a chairman, a secretary, a treasurer, and not fewer than seven other active members. Officers other than advisory members should be active members, that is, young farmers within the age limits of 14 to 30 years. Thus, if 10 active members are available, a club may be formed in any locality in the Dominion. Men beyond the limits of active membership may be elected as honorary members and may take part in all club discussions and activities, but they have no voting power. Annual meetings are held in the main, during March of each year, when all office bearers and three delegates to the annual district meeting (two active and one advisory) are elected.

Clubs are required under the constitution to hold a minimum of eight monthly meetings in each year, but may hold as many more as desired. In any one year at least five lectures on some practical aspect of farming must be given, and other club activities cover a wide range of social, educational, and competitive subjects. Club subscriptions are 3s. 6d. a member, of which 1s. is a subscription, at a specially-reduced rate, to the "Journal of Agriculture." Subscription to the "Journal" is obligatory to all Y.F.C. members of active status, and in addition members receive copies of the monthly "Y.F.C. Supplement" to the "Journal," in which news of the activities of the movement is published.

To encourage all club members to gain experience in public speaking and meeting procedure, clubs are recommended to elect new office bearers at each annual meeting and to refrain from returning the existing officers year by year. Further practice in public speaking and all that it entails is gained from the strongly-supported debating contests, impromptu speech evenings, and prepared speech competitions. Such activities do much to train members in expressing their thoughts clearly and concisely to an audience and thus help to achieve one of the aims of the movement—fostering the spirit of leadership and self-reliance—an achievement which must ultimately lead to an improvement in the conduct and value of rural life generally and to a higher standard of debate at meetings held by farmers' organisations throughout the Dominion.

From time to time new clubs are formed in areas where none existed previously. In any locality without a club young farmers, provided they can muster a group of at least 10, can band together to form a new club and thus become eligible for the many benefits to be derived from membership of the New Zealand Federation of Young Farmers' Clubs. Interested persons can secure all assistance necessary to the formation of a new club from their nearest Instructor in Agriculture or by writing direct to the Dominion Organising Secretary, P.O. Box 3004, Wellington.

REGISTRATION OF

DAIRY FACTORY MANAGERS

Intending applicants are hereby notified that applications for registration under the Dairy Factory Managers' Regulations should reach the Registrar, Dairy Factory Managers' Registration Board, c/o Department of Agriculture, P.O. Box 3004, Wellington, on or before 1st May, 1948. Forms are available from the Registrar.

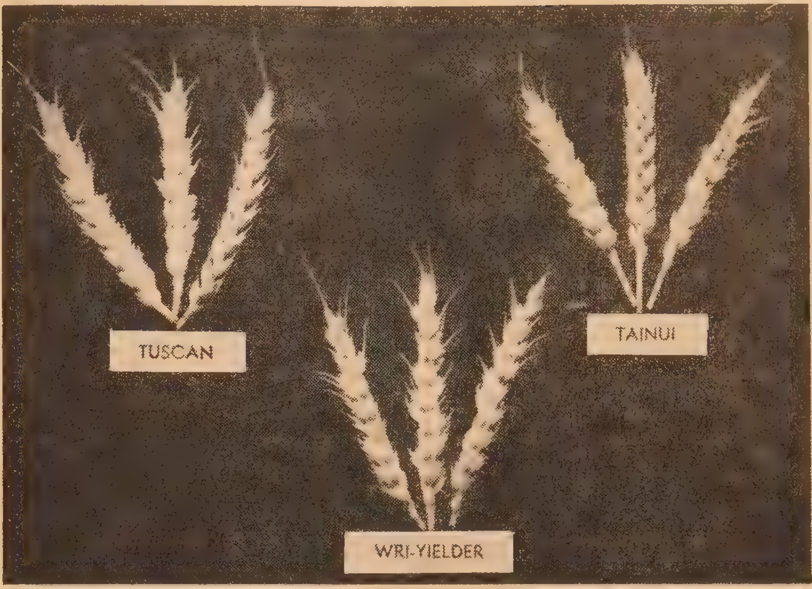
Attention is drawn to the fact that any application which is received by the Board after the 1st May, 1948, shall not, except in special circumstances, be considered by the Board until after 1st April, 1949.

E. M. EDGECOMBE, *Registrar.*

N.B.—*this notice refers to persons who are NOT AT PRESENT HOLDERS OF CERTIFICATES Notice of renewal and renewal form will be posted to every registered manager by the Registrar.*

A New High-yielding Wheat Variety—WRI-Yielder

A NEW wheat variety, the result of a cross between Tainui and Tuscan which has been named WRI-Yielder, has been bred by the Wheat Research Institute of the Department of Scientific and Industrial Research. The prefix "WRI" will be used for all new varieties produced by the institute in future, and the name Yielder expresses the greatest merit of the new wheat—its capacity for high yielding. This article, prepared by O. H. Frankel, chief executive officer of the institute, in co-operation with officers of the Fields Division, Department of Agriculture, gives preliminary information about the new variety.



[R. O. Blackmore photo.

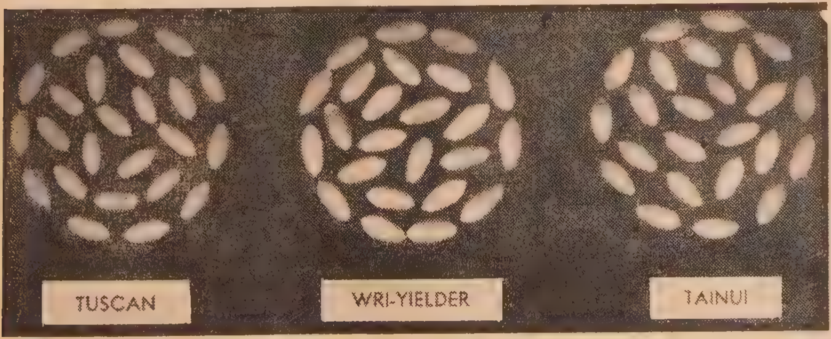
SEED propagation of this wheat has been seriously delayed by a number of circumstances and only about one-third of an acre of purified seed is now growing at the institute's station at Lincoln. Therefore another three years must elapse before large areas will be seen on Canterbury farms, but WRI-Yielder will be placed on the market as soon as sufficient stocks of seed are built up.

In the testing of this wheat—as in that of all other new and older varieties—the Wheat Research Institute has had the co-operation of the Fields Division of the Department of Agriculture. The importance of this assistance has been especially marked in the testing of a variety the value of which, entirely resting on over-all yield increases which are not very distinct in individual trials, could be established only in a large series of accurate trials.

Higher Yields

The chief virtue of the new wheat, which has resulted from a cross of Tainui and Tuscan made in 1933, is its superior yielding capacity. That became evident in its early small-scale trials at Lincoln and was confirmed throughout the years in nearly all wheat districts, extending from the Rangitikei to Southland. A full account of these and the present season's trials will be published later, but the tables with this article give a picture of the results to date.

Table 1 shows that the mean yield of Cross 7 over all trials was 44.72 bushels an acre and of WRI-Yielder 48.60 bushels, giving WRI-Yielder a mean superiority of 3.88 bushels. This mean difference is highly significant statistically. It represents an increase of 8.7 per cent. over the yield of Cross 7, and that, in view of the high yield of Cross 7 itself, is substantial. Its statistical significance over all trials is marked, and is illustrated by the fact that in the 29 trials WRI-Yielder was significantly superior in 10, non-significantly superior in 15, non-significantly inferior in 2, and significantly inferior in 2, both in Southland.



[R. O. Blackmore photo.

It may be concluded that this variety promises substantial yield increases over Cross 7 in many or most areas in the wheat-growing districts in the South Island, with the possible exception of Southland.

In the Rangitikei and Manawatu districts of the North Island Tainui is now the main variety. It has the advantages of returning excellent yields, of maturing early, and of being a good header wheat. Its disadvantage is its likelihood to lodge. WRI-Yielder was tried in this district in six trials against Tainui, and the results (Table 2) show that in this area the new wheat is not promising.

Results of the six trials show the mean yield of Tainui to be 53.8 bushels an acre, and that of WRI-Yielder 47.6 bushels, giving Tainui a superiority of 6.2 bushels. In all North Island trials except one Tainui has outyielded WRI-Yielder. The new wheat shows only one distinct advantage over Tainui: It is more resistant to lodging. In the Masterton-Wairarapa district Yielder has not been tested sufficiently; there it might prove a success.

In general appearance the new wheat lies between its parents, Tuscan and Tainui. It is a little taller than Cross 7, with a laxer and bigger head, and its grain is distinctly larger and heavier. Over all the trials in 1946-47 the mean weight of 1000 grains of WRI-Yielder was 48.5 grammes and of Cross 7 38.2 grammes. This difference, which is statistically significant, is no doubt in part responsible for the higher yield. The grain colour is red, as is that of Tainui.

A NEW HIGH-YIELDING WHEAT . . .

TABLE 1: TRIALS WITH WRI-YIELDER AND CROSS 7

Name of co-operating farmer	District	Date of sowing trial	Yields in bushels an acre		
			Cross 7	WRI-Yielder	Difference (Yielder minus Cross 7)
Wheat Research Institute	Lincoln	13/5/41	37.1	39.6	+2.5
Busch Brothers	Amberley	26/5/41	28.7	29.9	+1.2
J. F. Ruddenklau	Methven	13/5/41	45.9	48.5	+2.6
J. B. Starky	Amberley	22/6/42	29.5	30.9	+1.4
C. O. Redfern	Malvern	1/7/42	44.1	42.1	—2.0
J. Bland	Winchmore	25/6/42	32.0	37.5	+5.5*
Wheat Research Institute	Lincoln	3/5/43	31.1	34.8	+3.7*
Wheat Research Institute	Lincoln	22/6/44	47.5	50.2	+2.7
Wheat Research Institute	Lincoln	4/9/45	33.3	34.8	+1.5
A. W. Taylor	Methven	6/6/45	24.5	27.8	+3.3*
B. Evans	Winchmore	2/6/45	15.8	20.8	+5.0*
W. P. McKay	Wendon	28/9/45	70.0	71.2	+1.2
Experimental Farm	Winton	24/10/45	80.9	94.0	+13.1*
J. Simpson	Bulls	20/9/46	71.2	74.4	+3.2
E. G. Friedrich	Marton	12/9/46	46.0	52.7	+6.7
J. A. Colquhoun	Masterton	17/10/46	23.0	28.0	+5.0
F. J. Gorton	Oxford	18/6/46	31.0	38.3	+7.3*
J. B. and C. R. Bayley	Fernside	9/9/46	47.0	56.8	+9.8*
R. S. Gunn	Racecourse Hill	18/6/46	41.9	49.0	+7.1*
Wheat Research Institute	Tai Tapu	21/6/46	73.0	71.2	—1.8
A. M. Stevens	Rakaia	3/5/46	59.4	77.4	+18.0*
W. Lemon	Winchmore	16/5/46	30.8	34.1	+3.3
C. A. Campion	Highbank	1/8/46	55.6	61.4	+5.8
L. V. Talbot	Temuka	6/8/46	45.1	50.6	+5.5*
W. Allan	Taiko	11/9/46	39.8	44.5	+4.7
M. W. Austin	Maruakoa	16/5/46	40.4	42.8	+2.4
L. Paterson	Waikaka	8/10/46	53.2	55.6	+2.4
J. O'Callaghan	Dipton	19/9/46	47.3	43.3	—4.0*
W. Baird	Dipton	19/9/46	71.6	67.1	—4.5*

Differences marked with an asterisk are statistically significant.

TABLE 2: NORTH ISLAND TRIALS WITH WRI-YIELDER AND TAINUI

Name of co-operating farmer	District	Date of sowing trial	Yields in bushels an acre		
			Tainui	WRI-Yielder	Difference (Yielder minus Tainui)
Experimental Area	Marton	30/10/43	29	22	—7 (not statistically examined)
E. J. Cawdrey	Halcombe	22/9/45	61.5	61.0	—0.5
E. G. Friedrich	Marton	11/10/45	42.6	47.5	+4.9*
J. Simpson	Bulls	20/9/46	93.8	74.4	—19.4*
E. G. Friedrich	Marton	12/9/46	59.6	52.7	—6.9
J. A. Colquhoun	Masterton	17/10/46	36.3	28.0	—8.3*

Differences marked with an asterisk are statistically significant.

The new wheat matures about a week earlier than Cross 7. On the whole that is an advantage, though earlier flowering may increase the danger of damage from spring frosts, especially along the foothills, but that will have to be tested by practical experience over a number of years. Early maturity is an advantage for spring sowing, and as a spring wheat WRI-Yielder has done well in yield trials in the South Island.

Though much more resistant to lodging than Tuscan, Fife-Tuscan, and Tainui, WRI-Yielder is not as resistant as Cross 7. That must be borne in mind when it is being considered for heavy land where lodging is to be expected.

So far WRI-Yielder has proved a good header wheat and has not been seen to shed its grain. Further experience will show whether that is general, as only a great variety of observations can give complete assurance. This season's further widespread trials should decide this question if there are strong winds during the harvest.

In baking quality WRI-Yielder is very similar to Cross 7. That has been confirmed in the baking tests of samples from all the comparative yield trials mentioned.

Conclusions

WRI-Yielder is a variety which promises a substantial average yield increase in the main wheat-growing areas. It is recommended for all but the highest-fertility land, where Dreadnought is grown, or where varieties other than Cross 7 tend to lodge. In the main it is therefore recommended for Canterbury and North Otago, but not for the Dreadnought area in the south; neither is it recommended for Marlborough, South Otago, and Southland, where it is likely to lodge, or for the Rangitikei, where it seems to ripen too late and, perhaps for that reason, gives uncertain yields. However, on all the medium-heavy, medium, and lighter land WRI-Yielder is expected to justify its name. In addition to its normal use as an autumn wheat, the new variety promises well for spring sowing. As far as is known it is a good header wheat.

The place WRI-Yielder is expected to occupy may be illustrated by comparison with the existing varieties:—

- **Versus Cross 7:** WRI-Yielder usually gives a better yield, but its use is inadvisable where lodging is expected.
- **Versus Fife-Tuscan:** About the same yield; WRI-Yielder ripens much earlier, stands up better, and has better baking quality.
- **Versus Dreadnought:** WRI-Yielder is expected to yield less, but is a header wheat.
- **Versus Tainui (North Island):** WRI-Yielder usually yields less than Tainui, but resists lodging better.

A SURVEY OF WORLD FIBRE SUPPLIES

SOME important aspects of world fibre production are discussed in the following extract from a world fibre survey published by the Food and Agriculture Organisation of the United Nations. The survey was prepared primarily for the Third Session of Conference of FAO, held in Geneva. Because of the severe time limitations and the fact that the statistical records of the war years and the immediate post-war period are yet incomplete, part of the data must be considered as preliminary.

HUMAN requirements for apparel fibres cannot be determined in accordance with precise and objective standards comparable to those applied in the field of nutrition. However, the fact that there is no exact measure of fibre needs for human health and well-being does not mean that these requirements are any the less real. The importance of fibre products in the scale of human needs is illustrated by the fact that clothing and household textiles generally absorb a larger share of consumer expenditure than any other group of consumer goods except food. In addition to providing the world's cloth and apparel, fibres also serve a large variety of industrial and agricultural uses.

Just as fibre consumption varies between high- and low-income groups, so also does it vary greatly between high- and low-income countries. Calculations made for 26 countries and country groups reveal a very close relationship between pre-war average real income levels and net fibre consumption per head, well-to-do countries using nine or ten times as much per head as poor countries. Even when climate and social traditions are taken into account, the differences remain strikingly large. It is evident that very large increases in real incomes would be necessary to bring fibre consumption in chronic deficit areas up to adequate levels.

Effects of War

In addition to the chronic consumption deficits, severe textile shortages have developed as a result of the war. Two years after the end of hostilities consumer stocks of clothing and household textiles in many countries are still extremely low. The world's areas of major textile dearth are parts of Continental Europe, the Union of Soviet Socialist Republics, Africa, China, South-east Asia, and Japan. Domestic clothing consumption is still severely curtailed in the United Kingdom, and rationing of clothing has been retained even in countries with relatively-high general consumption levels such as Australia.

In 1946-47 world production of the five major clothing and household fibres—cotton, wool, silk, flax, and rayon—was 24 per cent. below the 1934-38 average. Because the carry-over of cotton and wool at the beginning of the season was larger than normal, the total supply of those fibres was about the same in 1946-47 as in 1934-39. World production in 1947-48 should be a little higher than in 1946-47 but still considerably below pre-war figures.

Taking account of world stocks in mid-1947, it is estimated that effective supply in 1947-48 will be slightly less than pre-war for cotton, though considerably higher than pre-war for wool. Cotton acreage was reduced during the war in all the chief producing countries because of either labour shortages or competition of food crops for the use of land. The Soviet flax and the Japanese silk industries were disorganised. Recovery in rayon production in Italy, Germany, and Japan is held back by lack of coal and caustic soda.

Shortages and Rising Prices

On the manufacturing side the most widespread difficulty continues to be the shortage of labour, which, in a period of full employment, can find better-paid work elsewhere. Lack of fuel, power, and chemicals has also impeded production. Between 1939 and 1947 the price of raw cotton almost quadrupled and the price of wool nearly doubled. Many countries find difficulty in paying for raw fibre imports, especially at current prices, though for some countries this has been circumvented by arrangements to supply fibres on credit and take payment in finished textile goods for export. The United Kingdom has already announced a reduction in raw cotton purchases for domestic consumption, and it seems likely that in 1947-48 the over-all import demand for raw fibres, particularly cotton, will decline unless loans and grants are made available from dollar areas.

Repercussions of World War II are still apparent in the major hard-fibre-producing areas of the Far East. Though output of abaca (hemp) in the Philippines has increased considerably in the past year, progress in rehabilitating the plantation industry has been slow. Indonesia has not resumed hard-fibre exports on any significant scale, and political developments add to the uncertainty about when those islands may again become important suppliers of sisal. European hemp production is recovering, but it has a long way to go to attain pre-war levels. Prospects for a more adequate jute crop in 1947-48 appear favourable, but the Indian jute economy is unsettled because of recent political developments.

Importing countries in general are experiencing post-war shortages of industrial fibres. Their processing industries are in most instances operating below capacity, and product shortages are widespread. The deficit in hard-fibre binder twine has been a cause of particular concern, especially in Europe.

Potential Abundance

Looking further ahead toward a period when the specific difficulties of world fibre supply resulting largely from wartime economic dislocation may be overcome, the pattern is one of potential abundance. The range of raw materials has been widened by the development of man-made fibres, and this process is still in a dynamic stage. The vast forestry resources of the world are more than sufficient to ensure that future aggregate world fibre production will not be hemmed in by absolute shortages of physical resources and not even by competing demands for land under fibre crops and pastures. There is also still scope for considerable expansion of natural fibre production by methods which need not involve a proportionate extension of land use. For instance, it is held by experts that great advances in the average wool yield per sheep could be brought about by selective breeding and the wide adoption of progeny testing of rams. Cotton yields could be increased by improved seed selection, greater use of fertilisers, improved insect control, and similar measures.

Given these possibilities of expansion, the future level of aggregate fibre supply will be determined largely by effective world demand. The intensity of inter-fibre competition will depend in part on general economic developments. In an expanding world economy with rising living standards and high industrial potential, especially in less-developed countries, there may be room for the simultaneous expansion of consumption of natural and man-made fibres. At the same time, the vastly-increased food needs resulting from expanding world income and population may be a to man-made fibres. If world consumption levels are not expanded, and if political insecurity and economic instability militate against the use of world resources on a truly international scale based on comparative advantage, inter-fibre competition will be intensified. Under such conditions the possibilities of technological improvement and cost reduction in the production of natural fibres, important in any circumstances, will become vital for the maintenance of their position in the world fibre supply pattern. This accentuates the importance, for example, of mechanisation of all processes involved in the cultivation and market preparation of vegetable fibres.

Apart from their price advantage, the competitive position of man-made fibres is further strengthened by the high degree of stability of their prices compared with those of natural fibres. That emphasises the primary producers' need for marketing methods which make for increased stability of natural fibre prices.

Changes in Demand

Another set of problems arises from difficulties of long-term adjustment of natural fibres production which even in an expanding economy may be necessitated by large-scale inter-fibre shifts in world demand. The automatic and unregulated adjustment of agricultural production to shifts in demand is often slow and painful. Indeed, the limited possibilities of alternative uses for some of the productive resources, the high proportion and rigid nature of overhead costs, and, in the case of wool, the length of the production period may result in an inverse elasticity of supply, a fall in world prices being met by an increase in world production.

Any attempt to interfere with the trend of natural fibre prices and to maintain artificially-high levels by restrictive measures is not only objectionable on general economic grounds but would also defeat its own ends by stimulating the use of near-substitutes. However, international long-term agreements aiming at interference with the trend of fibre prices by restriction must not be confused with well-thought-out programmes for the gradual transfer of productive resources, this transfer to be encouraged not for the purpose of maintaining artificially-high price levels for the remaining output but for the dual purposes of: 1, Mitigating the possible hardships to producers of a situation when price is left as the sole long-term regulator of supply; and, 2, diminishing the dangers resulting from the high degree of economic dependence of certain producing countries on the world market situation for a single fibre crop.

IMPROVED TIMOTHY STRAIN

ATTENTION was drawn in the "Journal" in February, 1947, to the availability of supplies of Certified seed of an improved strain of timothy developed by the Welsh Plant Breeding Station at Aberystwyth, and it was mentioned that a selection more adapted to New Zealand conditions was in course of multiplication.

Two areas in the Otago-Southland district sown out under contract to the Department of Agriculture with seed of this pedigree strain raised by the Grasslands Division of the Department of Scientific and Industrial Research will be harvested this season and the seed will be distributed by the Department of Agriculture as Certified Government Stock seed.

The leafiness of this pedigree strain of timothy is indicated by a departmental officer who, reporting early in February on one of the contract areas sown on heavy land, said that the crop had completely smothered all weeds except for a small area of docks. The stand was very dense and leafy, and though it had lodged, the seed heads were standing 3ft. high.

Single plants of timothy. Left—Unimproved strain. Right—Pedigree strain.

The farmer on whose land the other contract area was established has reported that growth of uncertified timothy seed crops on his type of land is usually very open with much bare ground showing. In contrast the seed crop sown with seed of pedigree strain is so dense in leafage that a man lying down in the crop could not be seen at a distance of a few yards.

The Department of Agriculture is now accepting applications for Certified Government Stock timothy seed of this strain and farmers wishing to obtain seed should apply in accordance with the conditions set out in the statement on this page.

J. H. CLARIDGE,
Agronomist, Wellington.

Certified Government Stock Seeds

APPLICATIONS for allocation during the current year of the following Certified Government Stock seeds are at present being accepted by the Department of Agriculture:—

Perennial ryegrass
Short-rotation ryegrass
Italian ryegrass
Timothy
White clover
Montgomery red clover
Cowgrass (broad red clover)
Lucerne

Applications for these seeds must reach the Director of the Fields Division, Department of Agriculture, Box 3004, Wellington, not later than **May 31 next** to be considered in any allocation to be made this year.

Applications must be made by mercantile firms on behalf of individual growers and must include:—

1. Name and address of grower.
2. Quantity of seed required.
3. Acreage of paddock to be sown. (If more than one paddock acreages of each to be given separately.)
4. Registered number and letter of area concerned if possible.
5. Where more than one class of seed is requested the application must state clearly whether the seed is required for separate areas, whether the requirement is in the nature of an alternative application for the same area, or whether different kinds of seed are to be sown together in the one area.

Note.—Certified Government stock cocksfoot seed is produced and distributed by the Canterbury Agricultural College, Lincoln, to whom intending purchasers are referred for particulars.

Pig Broadcasts

UNDER the auspices of District Pig Councils broadcasts will be delivered in April as under:—

Auckland—1YA, on April 27, at 12.35 p.m., "Management of the Sow—Weaning to Farrowing," by C. W. Wallace, Supervisor, Waikato District Pig Council.

Napier—2YH, on April 9, at 7.15 p.m., "Maintenance of the Layout," by H. Hopkins, Supervisor, Tairawhiti District Pig Council.

Palmerston North—2ZA, on April 16, at 7 p.m., "More Pig Meat from Whey Next Season," by L. L. Marsden, Supervisor, Wellington District Pig Council.

Dunedin—4YA, on April 12, at 7.15 p.m., "Pig Raising on a Sound Basis—Some Examples," by N. Macdonald, Supervisor, Otago and Southland District Pig Council.

THE HOME GARDEN IN APRIL

By A. G. KENNELLY, *Instructor in Vegetable Culture, Christchurch.*

BY April there is no doubting the presence of autumn. In most districts the evening air is chill and not conducive to growth, and the home gardener can no longer rely on getting immediate vigorous growth from most young plants or newly-sown seed; on the other hand, because of rain or autumn dew, watering usually ceases to be a problem. Though generally the season of growth for tender and half-hardy crops such as melon, marrow, pumpkin, and tomato is finished, steady growth can still be expected from hardy plants such as the cabbage family, leeks, silver beet, and spinach.

ALL growing crops should be kept weeded and cultivated. The harvesting and storing of crops such as kumaras, potatoes, and onions should be completed without delay. The work of clearing the ground of the refuse of recently-harvested crops and of digging or forking over vacant ground should also be undertaken as opportunity offers. The compost heap should be built up; it may be advisable to build a new section so that the partly-rotted material forming the existing heap will be available more quickly.

Celery and leeks can be earthed up, and where it is not yet necessary to harvest all tomatoes the plants should be stopped to help swell the fruit. Toward the end of the month, if space is at a premium, root crops such as carrots and beetroot can be lifted if it is desired to store them. Celery should be kept sprayed to control leaf spot. Spinach can be sown, and in some districts an early sowing of broad beans and peas can also be made.

Artichokes (Jerusalem)

Though it is said to be similar in food value to the potato, the Jerusalem artichoke has a distinctive flavour and requires a different method of cooking. The tubers are not unlike knobby potatoes in appearance but are better not lifted until required for the table. As soon as growth has ceased the heavy stems can be cut down and, after being bruised to hasten breaking down, put on the compost heap.

Asparagus

The asparagus bed should be kept free from weeds, but it is not advisable to cut down the top growth until the foliage begins to turn yellow because of the onset of cold autumn weather. While the tops are green the plants are manufacturing plant food and building up crowns from which strong spear growth can be cut next spring.

Broad Beans

Though April is rather early for sowing broad beans, in southern districts some growers like to make a first sowing toward the end of the month. Very early-sown beans do not necessarily yield pods earlier than those sown somewhat later, for though the plants may make good growth in the late autumn and early winter they are

This simple structure transforms what would otherwise be a very ordinary and probably unattractive corner into a delightful spot which is also very useful for the home gardener. The roof is thatched with manuka and wired in place. Though located in a suburban garden, the undressed timber gives a natural, rustic air, the attractiveness of which will be enhanced later by the climbers which have been planted at each pillar. A bower such as this provides a fine temporary repository for a varied assortment of garden objects. Seed-boxes, flower pots, bags of manure or leafmould, and small garden tools such as watering cans, hand forks, trowels, or secateurs can be left in it; bulbs can be dried off and pumpkins and marrows will be safe from frost in it; shelter can be given to frost-tender seedlings or germinating seed. The paved floor is easily swept and is clean and dry underfoot whatever the weather. The home gardener who already has sufficient shed or frame space may prefer to build a rustic seat around the wall in place of the bench shown.

likely to be severely damaged and checked by boisterous winter weather; the earliest flowers may fail to set because they are produced at a time of unfavourable soil conditions and sudden, extreme temperature changes.

Two main types of broad bean are grown in New Zealand—the broad-podded or Windsor variety and the long-podded varieties such as Early Long Pod and Mammoth Long Pod. The Windsor type is usually considered to be of superior flavour but the long-podded beans are hardier and yield more heavily and they are also said to be earlier. Two other varieties which are not so commonly seen are the small-podded variety, which may be dwarf or tall and is represented by strains such as Dwarf Gem and the tall Mazagan; and the dwarf variety such as Coles Early Dwarf, which is very useful for small gardens.

Broad beans sown in the autumn mature at a time when fresh green vegetables are at a premium and, as they are easy to grow and require very little attention, they deserve a place in the garden of every home where their flavour is appreciated. They do well in heavy, well-drained soil that has been thoroughly cultivated and into which has been dug a moderate supply of organic material such as compost or farmyard manure.

The disease known as chocolate spot (*Botrytis cinerea*) is often troublesome during the winter and in severe weather may cause partial defoliation or even the death of the plants, but where the ground is well supplied with phosphates and potash the disease is less likely to cause serious trouble. Superphosphate at the rate of 2oz. a square yard and a good dressing of unleached wood ash worked into the surface soil before sowing will therefore provide some insurance against chocolate spot if drainage and air circulation are satisfactory.

Seed can be sown in single rows or diagonally in double rows about 10in. apart, with the seed pressed 2in. deep into the bottom of a trench 3in. deep. Rows, either single or double, should be 3ft. apart and the seed 6in. apart in the rows. Germination is usually good, but it is advisable to plant a few extra seeds at the end of the row to fill gaps. A quart of seed will sow about 100ft. of single row.

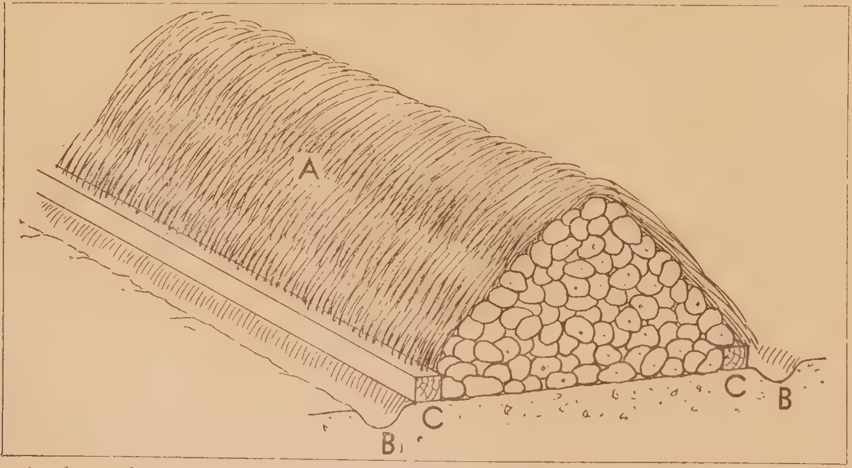
Celery

In most districts celery will have reached its maximum development by now and if it has not yet been blanched, that work should be done. Single or double rows can be individually wrapped with paper or earthed up with clean soil which preferably contains little organic matter and is free from the eggs of slugs or other injurious insects; under wet conditions rots are likely to develop if soil remains touching the inner stalks after earthing up is completed. Earthing can be done in two or three stages, but wrapping with stout paper is often more satisfactory. For the newer varieties such as Golden Self-blanching, which are usually grown in multiple rows, blanching is easily done by placing lengths of 12in. x 1in. timber along the outside edge of the bed.

Regular spraying with Bordeaux or suitable Government certified copper fungicide should not be neglected, as the celery leaf spot (*Septoria apii*) spreads rapidly in the moist conditions which usually prevail in late autumn.

Kumaras

The kumara crop should have reached maturity by April, and where there is danger of frost digging should be started as soon as practicable. A broad-tined fork should be used and great care taken not to damage the tubers, which should be gathered in heaps to dry off and then sorted over before being stored as advised in last month's notes. Large quantities can be pitted similarly to potatoes; small lots can be stored in sand.



A clamp for storing potatoes. A—Straw thatch. B—Trench for drainage. C—Timber at sides to form base.

Onions

In most districts it is advisable to complete the harvesting of onions in April, as drying conditions are not so favourable later. Only sound, well-formed bulbs which have been properly cured should go into storage for use late in the season; onions not of the quality for storage should be put aside for immediate use. Small quantities of onions can be strung or stored in open-mesh bags in a cool, ventilated shed or cellar, but because of the injury which often results where there is a considerable weight of onions in a bag, if considerable quantities are to be stored it is advisable to use storage crates or to store the onions on slatted shelves. Onions should not be exposed to direct sunlight during storage, as that may promote early growth. If it is necessary to store them outside, a dry, sunless position where there is good air draught is desirable. The onions should be covered against the rain and preferably placed on a structure far enough above ground to enable air to circulate under them. Departmental trials have indicated that Turbott and Pukekohe Longkeeper are the best keeping varieties.

In general, however, assuming storage conditions and sorting to be satisfactory, losses in storage are largely caused by the conditions under which the onions are grown and harvested, that is, whether growth was rank because of the soil being very rich in nitrogen, or hard, usually the result of the reverse condition; whether the weather was favourable or otherwise during harvesting; whether the onions were damaged in being lifted; and whether the ground on which they were grown has been cropped with onions for a number of years without adequate rotation and is thus, as is usually the case, infested with the spores of some of the many diseases, such as neck rot and mildew, which are likely to affect onions in storage.

Potatoes

The digging and storing of main-crop potatoes will now be well under way in most home gardens. Potatoes are an important item of diet and should be dug and stored with care. They are a good source of vitamin B_1 and are said to be the chief source of vitamin C. In view of the vitamin C value of oranges that may seem surprising at first but is less so when the relative consumptions of oranges and potatoes are considered. As well as starch and sugar, potatoes also contain some iron and calcium.

Tubers intended for seed should be put aside after being dug so as to be readily available when required for sprouting and greening in boxes before being planted, but the use of Certified seed is to be preferred in most districts, as home-saved seed is likely to be affected with crop-reducing virus diseases. Where shed or cellar space is not available or is unsuitable, potatoes can be stored in a pit or clamp. Only sound, dry tubers should be put in a clamp, which is easily made as illustrated on page 226. The land on which the clamp is to be made should be well drained and, if necessary, it should be surrounded by a shallow trench to carry off excess water. For large quantities of potatoes clamps usually have an oblong base, but a circular base is suited to the small quantities of potatoes pitted by the home gardener. Clamps are triangular in cross-section and should be covered with a thick layer of straw—at least 4in., the thickness depending on the severity of the frost to be expected. The clamp should be built up as steeply as convenient—an angle of 45 degrees is practicable—and the sides and ends covered with straw as building progresses. To shed rain the top should be capped with straw placed across the ridge so that the ends overlap the straw at the sides. The thatch can be secured against wind by a light covering of soil or by pieces of wood, but if soil is used gaps must be left at the top to permit ventilation.

Pumpkins and Marrows

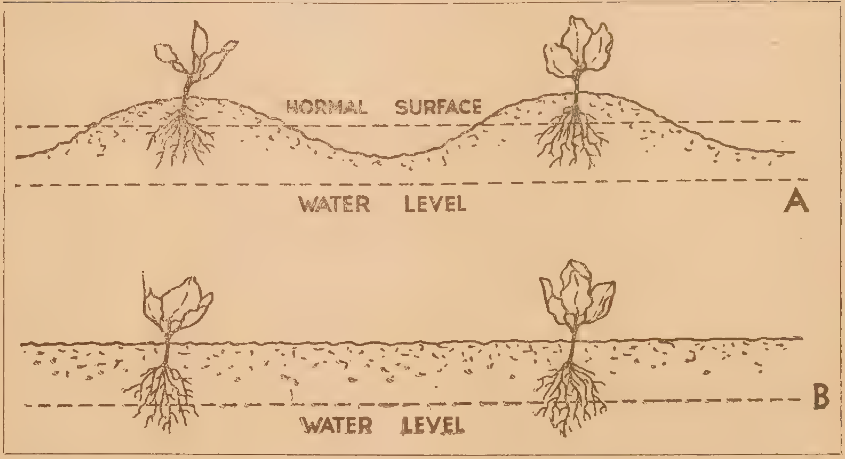
In districts where frosts of more than a few degrees are expected all pumpkins and marrows should be harvested now; elsewhere the swelling fruits can be lifted on to a slab of wood or sheet of glass to keep them off the ground, as rotting caused by insect attack or mechanical injury is frequent in late autumn. Plants that are still growing can be protected from frost by spreading over them a piece of paper held down at the edges with stones. Pumpkins and marrows should be stored under dry, frost-free conditions. In some districts they can safely be put on boards or straw under a hedge, but usually a dry, well-ventilated shed is preferred.

Rhubarb

It is advisable to keep the rhubarb bed free from weeds. Weed seedlings make strong growth in the rich soil which suits rhubarb, and regular weeding will ensure that weeds, particularly perennial kinds, are removed before their strongly-growing roots or stolons penetrate the soil immediately about the crowns and so become difficult to remove. When the beds are being forked over, the soil about the crowns can be dressed liberally with compost or stable or farmyard manure.

Root Crops

Carrots, beetroot, parsnips, and swedes are best left in the ground unless the area they occupy is required for other crops. Some varieties of beetroot are susceptible to damage from severe frost, but in most districts no harm need be expected to any of these vegetables from frost or environment if the soil is well drained and not too heavy. Parsnips and swedes will, in fact, benefit from frost. Should digging be necessary, the roots can be stored in sand or fine coal ash in a shed or cellar or a box sunk in the open ground; swedes usually keep quite well even if they are not "plunged," but cool and (provided the roots are sound) reasonably-moist conditions are desirable for the storage of all root crops.



Greens to be grown in low-lying or badly-drained soil should be planted in hoed-up rows so that the roots do not reach the water level. A—Right method. B—Wrong method.

Spring Cabbage

If seed was sown as advised in early autumn, young spring cabbage plants should now be sturdy, well grown, and ready for setting out. If early cabbage is desired, the situation should be sheltered and where possible have a northerly aspect to obtain the benefit of maximum sunshine. The ground should be well drained, and where only small areas are being grown it may be advisable to make a raised bed.

Manurial requirements are very high. Organic material such as compost or stable or farmyard manure in liberal quantities should be dug into the soil before the plants are set out, or a dressing made up by mixing two parts of blood and bone and one part of superphosphate can be worked into the topsoil at the rate of 6oz. to the square yard. If the soil has not been limed recently and there is a risk of its being acid, a dressing of 2 to 3oz. of lime to the square yard can be dusted on the surface and lightly forked in. During July or August, according to district, the young plants will usually benefit from a dressing of nitrate of soda or sulphate of ammonia hoed lightly in around the surface of each plant at the rate of up to 1oz. a plant.

In some districts home gardeners like to make a late sowing to have plants for setting out in the first favourable weather of spring. Except in the warmest districts or in the most favourable situation, the seed should be sown in prepared soil in a frame or cool, open glasshouse. Broadcast or sow the seed ½in. deep in rows 12in. apart in soil which is rich in well-rotted organic material. Except in the northernmost districts the variety most favoured for autumn sowing is Flower of Spring.

Tomatoes

During the latter part of April most districts experience frost, and where more than a few degrees are expected it is advisable to gather all tomatoes that are reasonably mature. Well-coloured fruit can be put aside for immediate use or for preserving; the remainder should be stored under conditions that enable ripening to take place without collapse or softening. Home gardeners often put fruit on a sunny windowsill or expose it under glass to the sun to colour or ripen, but such treatment is usually advisable only with fruit that is nearly mature. Ideally fruit should be ripened in a properly-insulated building, preferably with floor and walls of brick or concrete and walls insulated with moisture-proofed materials that do not contain creosote. However, the quantities of fruit to be ripened by the home gardener are usually so small that a shed or even a box can be used. Sound green fruit that is dry and reasonably mature though not coloured can be packed in boxes and the boxes stacked one on top of another in a shed. Light is not necessary for ripening. Temperature, humidity, and control of atmospheric gases—carbon dioxide is the retarding factor—are all important. The commercial grower can probably aim at a steady temperature of about 72 degrees F. with relative humidity at 88 to 90 per cent. After estimating the cubic capacity of his storage room and perhaps releasing a predetermined amount of gas, in the form of town gas, acetylene, or ethylene, he can ventilate according to a previously-determined schedule and otherwise strictly observe certain conditions. But for the home gardener such an exacting regime is not possible; the best he can do is to reproduce such of the conditions of temperature and humidity as are convenient.

Where a relatively-large number of plants is grown there will now probably be more tomatoes than can be consumed immediately. If that is so, it is a good plan to preserve the excess. Tomatoes are particularly notable for their content of vitamin A, which promotes growth and protects the eyes, and vitamin C, which is essential for healthy tissues and teeth. They also have a smaller amount of vitamin B_1, which aids growth and digestion and is said to be especially good for the nerves. Correctly-preserved tomatoes retain much of their vitamin content and are therefore especially valuable for use during the winter.

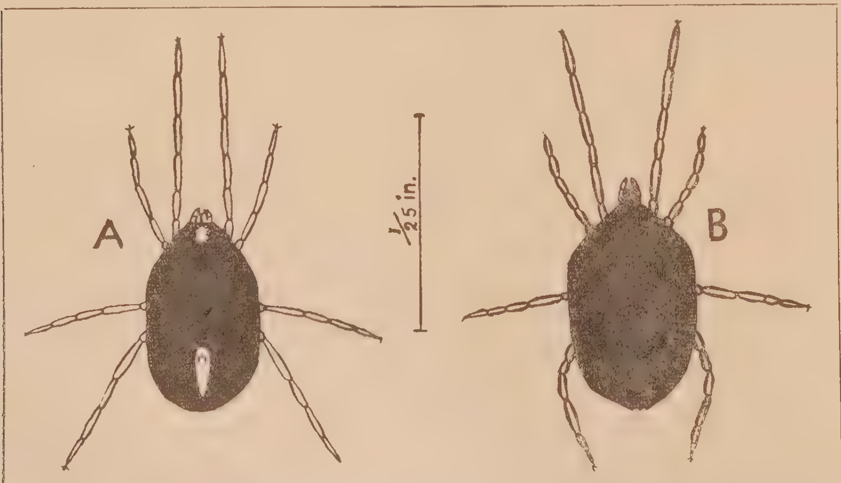
Following is a method of preserving tomatoes (recommended by the Rural Sociologist, Auckland, in the "Journal" for October, 1946,) in which broken-skinned and very ripe fruit can be used as well as the unblemished fruit that is only just ripe. The tomatoes should be peeled and cut into quarters and packed tightly into jars. Use 1 teaspoon of salt to each quart jar, sprinkling it in when the jar is one-third, two-thirds, and quite full. The flavour is improved by the addition of 1 to 2 teaspoons of sugar to each 2lb. of fruit. Add no water but press the tomatoes down well so that they are covered in juice, adding extra from other cut and pressed tomatoes if necessary. Adjust the caps and immerse the jars in a prepared water bath, making sure they are covered and the water circulates freely around each one, and process them for 35 minutes from the time the water bath boils after the jars are put in. Remove some of the water so that the jars can be grasped and taken out one at a time and stood on a wooden object to cool. If necessary, tighten the caps as the jars cool, but take out only one at a time, as each must be finished off as quickly as possible while still hot. If using self-sealing jars, do not tighten the screw band after processing or the seal will be broken. Store the tomatoes in a cool, dark place, as light destroys their colour and vitamin C.

New Zealand and Overseas Seasons

Many home gardeners in New Zealand refer to books or catalogues published in Britain or the United States of America. Where months are mentioned the following table will be found useful:

January	:	July
February	:	August
March	:	September
April	:	October
May	:	November
June	:	December

If any month in either column is assumed to be British or U.S., the month opposite will be comparable in New Zealand, and vice versa. Though the seasons are reversed they are not, from a gardening point of view, exactly reversed. For instance, a gardening programme for February designed for northern Britain or the northern United States would hardly be wholly appropriate for the corresponding month, August, in the Auckland Province.



A—The blue oat mite. B—The red-legged earth mite. The white areas in the illustration are reddish in the living mites.

Red-legged Earth Mite

From time to time new pests and diseases affecting farm, orchard, and garden crops are recorded in New Zealand, and officers of the Department of Agriculture are not infrequently associated with the new record. Field officers are stationed in practically all populated parts of New Zealand and their services and advice are available in combating pests and diseases. Most officers have an up-to-the-minute knowledge of the recognition and control of pests and diseases affecting the crops with which they are associated, but many specimens are sent each year to the Plant Diseases Division of the Department of Scientific and Industrial Research for identification or advice about control.

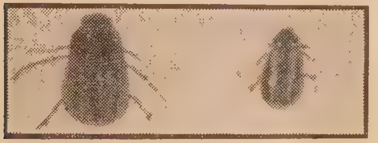
A comparative newcomer to New Zealand, the red-legged earth mite (*Halotydeus destructor*) has been recorded in only a limited area to date. It was first noticed in New Zealand in 1942 and a survey made in 1946 recorded that it was distributed over a large area at Napier, near Gisborne, and in Wairoa. It has been a vegetable pest in Australia for many years and attacks a wide range of both weeds and cultivated plants. Weeds such as Scotch thistles and wild turnip seem to be preferred, but many herbaceous, succulent, broad-leafed plants in the flower garden are also attacked. Among the vegetables, tomatoes, French and broad beans, peas, potatoes, asparagus, silver beet, and marrows have been damaged in New Zealand. Turnips, melons, lettuce, and tobacco plants are also reported to be damaged in Australia. The adult mite is about 1/25in. long, mat black, and rather velvety in appearance. It has four pairs of salmon-pink legs and is visible to the naked eye even when it is on the ground. The mites are very active and tend to cluster in groups when feeding. The eggs are yellowish-orange and barely visible to the naked eye.

In areas of low rainfall and high soil temperatures in summer the mite is present only in the egg stage in summer. The eggs hatch in autumn when the rains begin and temperatures are lower. The mites cannot fly and are seen on the plants in the early morning or evening and throughout the day in dull weather or in sheltered situations. Though its spread under its own locomotion is likely to be slow, it may be accidentally transported with soil or on flowing water, and a close watch is being kept, especially by officers of the Horticulture Division, so that it can be identified and if possible immediately exterminated should it spread to other districts. Home gardeners in districts other than those in which the pest is known to be established should advise their nearest field officer of the Department of Agriculture if there is reason to suspect its presence so that immediate action can be taken.

The red-legged earth mite should not be confused with the blue oat mite, which is a somewhat similar but slower-moving mite, having brighter red legs and a reddish streak (which usually requires magnification to be seen) in the middle of the back toward the tail. A full description and measures for the control of the red-legged earth mite appeared in the "Journal" for January, 1947. The mite lives on a liquid diet obtained by piercing the leaves or stems of soft, succulent plants and sucking the sap or cell contents, usually causing the death of the cell. A heavy infestation with numerous punctures may leave the leaf blotched with white or silvered and the whole leaf may die.

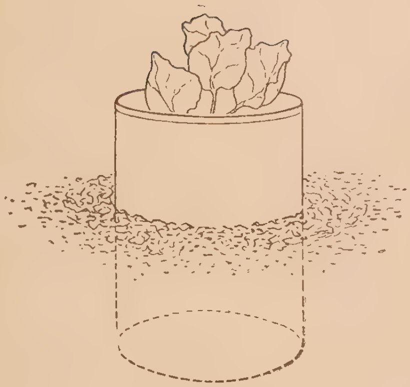
Beetles of Grass-grub

The smaller of the two grass-grub beetles illustrated is that of the common grass-grub (*Odontria Zealandica*). The beetles are brown and the smaller one is about the size of a very small bean. They turn from the pupal stage into beetles about the end of October and lay their eggs in November. The beetles often do considerable damage to ornamental shrubs, roses, and certain fruit trees and are difficult to control. Some protection can be afforded by spraying foliage with arsenate of lead at the rate of 1¼oz. to 4 gallons of water.



Two beetles of different species of grass-grub.

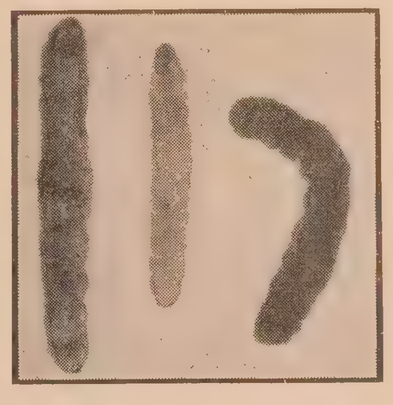
However, the greatest damage is done by the grubs, which are cream coloured with dark heads. They are slow in movement and are usually found curled up at the roots of the plants which they attack. They damage the roots of lawn grasses and strawberries, but beds can be "grub proofed" by treatment with arsenate of lead bait at the rate of 1lb. mixed with twice its weight of sand and spread over each hundred square feet of lawn. The grubs also attack shrubs, raspberries, or autumn-planted ornamental seedlings, and though they rarely cause the deaths of large plants they weaken them by continually eating the roots. Isolated attacks which cannot be eliminated by digging can be effectively dealt with by making holes 4 or 5in. deep with a stick around the infested plant and pouring in a little carbon bisulphide. The holes must be closed immediately, and as the carbon bisulphide is highly inflammable, it should be kept away from naked lights and securely corked when not in use.



A young plant protected from cutworms by a collar of tin or hard cardboard.

Cutworms

Home gardeners sometimes find that young plants recently set out are cut off close to the ground. Young cabbage and cauliflower plants are commonly attacked by caterpillars, of which the commonest species is the cutworm. The common name "cutworm" arises from the caterpillars' habit of cutting the plants off so that they fall over and are eaten. In the daytime the caterpillars can usually be found curled up in the ground close to the plants they have been attacking. They are smooth bodied and somewhat variable in colour and from about 1¼ to 2in. long when fully grown. They are active throughout the growing season, but the damage they do is particularly noticeable in spring when young plants are being set out. Later, cavities may be eaten out of root vegetables such as beetroot; they occasionally even eat their way into the hearts of well-grown lettuces.



Cutworms.

Where only a few young plants are set out, isolated in rows, protection can be obtained by enclosing each plant in a collar of tin or hard cardboard pressed into the ground on its edge so that 2 or 3in. project above the ground. Care should be taken that no cutworm is enclosed in the collar, which can usually be removed safely when the plant is strongly established. Where cutworms are especially numerous and troublesome it is advisable to apply a poison bait made as follows:—1oz. of Paris green mixed with 1½lb. of bran, 3 fluid ounces of molasses or syrup, and 1½ pints of water. The whole should be mixed thoroughly and broadcast around the plants attacked. This bait is also effective against subterranean grass caterpillars (porina) on lawns, and the amount given is sufficient to dress an area 20 yards by about 10 yards. The mixture will go mouldy if kept for more than a few days, so should be used at once.

Earwigs

The European earwig has been established in New Zealand for many years and is occasionally responsible for damage to fruit, flowers, and vegetables. It usually spends the winter in the ground, where it lays its eggs, which hatch in the spring. The tiny earwigs sometimes feed on the pollen and pistils of flowers; as they become larger they feed on petals, leaves, and fruit, and the damage they do may be considerable. Earwigs shelter during the day under such objects as stones, sacking, and pieces of wood, and this habit of sheltering provides a method by which they can be trapped. Short lengths of hollow stem—broad bean stem is useful—or pieces of crumpled paper or upturned flower pots containing loose moss can be left lying about the area infested by the earwigs. If these objects are shaken every day or so over a bucket of water containing a little kerosene, the earwig population will soon be reduced, as earwigs are nocturnal feeders and during the day they retreat to any object which apparently offers a dark, dry shelter. Alternatively, a bait made of 3oz. of sodium fluosilicate or sodium fluoride, 1 pint of molasses or treacle, 3lb. of wheat bran, and 1½ quarts of water can be made by dissolving the poison in water and mixing in the molasses, finally adding the bran and mixing thoroughly. More water may be required, but the bait should not

An earwig.

be wet or there is a danger of its scorching plants. It should be broadcast late in the evening, and in gardens heavily infested three applications may be advisable. The best times to apply are early and late in October and finally about the middle of December.

Wireworms

The roots of all kinds of garden plants are likely to be damaged by wireworms, which are hard, wiry grubs, usually reddish- or yellowish-brown, with three pairs of legs behind the head. They are difficult to control in the home garden, as they have a life span in the soil of up to three years or more, and, though heavy liming or crude naphthalene dug into the soil at the rate of 3 or 4oz. a square yard is said to give some protection, probably the best methods for the home gardener are the use of a bait such as a half potato stuck on a stick and buried just under the soil surface so that it can be lifted and the wireworms killed from time to time, and the destruction of wireworms and beetles seen during digging or clearing the garden.

The beetles are sometimes known as "click beetles" from their habit when overturned of springing into the air with quite a loud click when they right themselves.

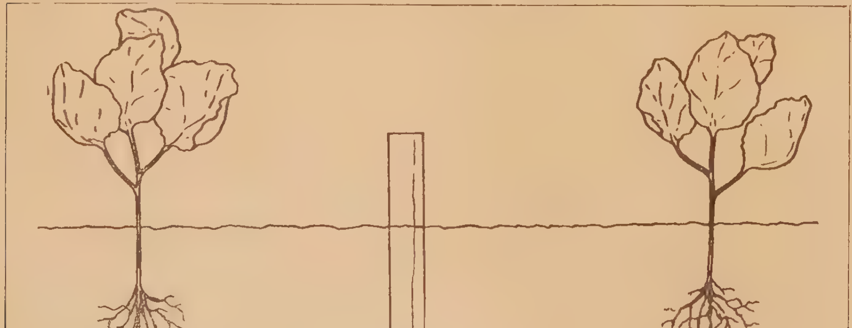
Wireworm beetle.

Wireworms.

Earthworms

Few gardeners do not now recognise that the earthworm is a valuable asset to the garden. Though it has been stated that some of the world's highest-yielding croplands have few earthworms in them, a mass of evidence substantiates the claim that a great deal of land would be very much poorer, if not totally unproductive, without them. The burrows of earthworms penetrate the soil to great depths and are of considerable benefit in aerating and draining it, for, though earthworms usually live near the surface, in long-continued dry weather or in periods of severe cold some species have been found at depths of up to 8ft. The burrows usually run down slightly obliquely, though occasionally they are perpendicular. Home gardeners sometimes consider that their garden soil contains few earthworms because of the absence of castings, but worms do not always eject castings on the surface of the ground. When opportunity offers they deposit them in cavities in newly-turned soil or between the stems of banked-up plants. Furthermore, the castings are not only ejected in cavities or at the mouths of the burrows but are also used to line the burrows. Worms live on organic matter and their castings are relatively rich in plant food.

Photographs in this article are by Green and Hahn Ltd.



A potato trap for wireworms. A stick pushed into the ground above the trap or into the half potato marks the position.

Greater Fertiliser Utilisation Secured by Soaking and Coating Seeds

RESULTS of research work of great potential value to New Zealand appear in a section "Coating Seeds with Fertiliser" in a paper entitled "Miscellaneous Methods of Fertiliser Application" in the issue Vol. 10, No. 2 (1947), of "Soils and Fertilisers," published by the Imperial Bureau of Soil Science, Harpenden, England. Investigations of this type have been commenced in New Zealand by the Department of Agriculture.

THE review states that Gusev (Chemiz. Soc. Agric. No. 5, 1940 (43-45)) claimed that by treating cereal and other seeds with phosphates before sowing a utilisation of 70 to 80 per cent. of the phosphate was obtained. (This is far greater than comparable figures for utilisation of phosphates topdressed on grasslands.) The seed was either moistened with a concentrated solution of phosphate fertiliser or coated with starch paste and fertiliser.

"W. O. Roberts at East Malling Horticultural Station (paper in the press) has obtained striking increases in the yield of wheat by soaking the seed in half its weight of a 5 per cent. solution of potassium hydrogen phosphate and then drying it at 22 degrees C. The experiments were made on phosphate-deficient soils and to some plots 24cwt. an acre of limestone were applied, and to others 0, 2, and 4cwt. an acre of slag. An increase in yield from the soaked seeds was equally apparent whether or not lime or slag had been applied. The figures suggested that the phosphate was about 60 times as efficient when soaked into the seed as when applied to the soil.

"In a trial with oats an increase of yield of from 17cwt. to 25cwt. an acre was obtained on phosphate-deficient soil at the cost of 13.6lb. an acre of potassium phosphate without the addition of any other phosphate to the soil. There was a correspondingly large increase in the weight of straw. Nearly 75 per cent. of the phosphate introduced in this way was recovered from the harvested grain.

"Wheat was adversely affected by concentrations of more than about 5 per cent. in the soaking liquid, whereas barley and oats could tolerate up to 30 per cent. It was found that the phosphate imbibed by the seed was deposited mainly in the husk, from which it could be washed by running water."

Such discoveries may have important practical application in New Zealand.

SEED PRODUCTION IN NEW ZEALAND

THE GRASS AND CLOVER SEED INDUSTRY

By J. H. CLARIDGE, *Agronomist, Wellington.*

EVERY farmer is at some time a user of pasture seeds, many are producers of them, and despite the increased export trade of recent years New Zealand remains its own best customer for seeds grown in the country. The methods adopted in the production of pasture seeds are the subject of a series of articles, of which this is the first, to be published in the "Journal."

AN essential prerequisite to good grassland farming is an adequate supply of high-quality grass and clover seeds. A very large proportion of New Zealand's production is derived from pasture and, whether the farming is all-grass or whether it includes a cropping programme, the importance of good seeds in the maintenance of that production cannot be overstated.

The export trade in pasture seeds is no small one and increased markedly during the war. New Zealand, however, is still by far the largest consumer of the seeds produced in this country and the export market fades into relative insignificance in comparison with the real purpose of the small-seeds industry, which is to produce grass and clover seeds to renew, improve, and extend the pastures of the Dominion.

No accurate figures of domestic consumption of grass and clover seeds are available. The amount of seed used in any one year depends on several factors, principal of which is the area to be sown in grass each season, which must have been affected during the war years by the availability of fertilisers. Another important item affecting the quantity of seed sown to the acre is the cost of the seed. It is estimated that half a million acres are sown to pasture each year, and on that basis the quantity of seeds used annually in New Zealand has been calculated.

Though the export trade increased markedly during the war, New Zealand is still its own best customer. The real purpose of the small seeds industry is to produce grass and clover seeds to renew, improve, and extend the Dominion's pastures.

Farmers in New Zealand have been producing seed since the early days of European settlement.

Though such a calculation must be only approximate, there is some support for the various figures arrived at in the difference between the production figures and the export over a number of years. It is not possible to take this difference as the measure of local consumption, however, as the production figures are not completely accurate and the result obtained would take into account seed retained in the country not because it is required for sowing but because there is no overseas outlet for it. The consumption figures given in the table which follows, based on the sowing of 500,000 acres a year, are therefore taken as the basis for a comparison with the quantity of seed exported:—

	Estimated annual Consumption	Average export 1937-42	1943-46
	Tons	Tons	Tons
Perennial ryegrass	5,000	652	2,105
Italian ryegrass	1,250	546	1,185
Cocksfoot	1,000	132	216
*Timothy	125	—	—
White clover	750	332	1,022
Red clover	750	261	733
†Subterranean clover	100	—	—

* During 1937-42 there was an average annual importation of 103 tons of timothy, but during 1943-46 local production increased and the average annual importation fell to 75 tons. (There were no importations in 1944 and 1946.)

† During 1937-42 the average annual import figure was 185 tons, consumption then being at a much higher level than at present. During 1943-46 importations averaged 82 tons annually.

These figures indicate the relative sizes of the local and export markets but fail to stress their relative significance. The export trade provides overseas funds, but sowings within New Zealand are at the root of a great deal of the primary production of the country.

Effect of Embargoes

Considerable publicity has been given to the import embargoes imposed against various grass and clover seeds by the British Government because of the accumulation of stocks in the United Kingdom, and in some quarters this action has been described as calamitous to pasture seed production in this country. However, figures show that the United Kingdom takes about half of New Zealand's exports of grass and clover seeds, Australia being also a large buyer and America taking considerable quantities of certain types. Further, it has not been indicated, nor

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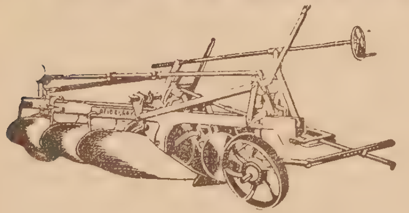

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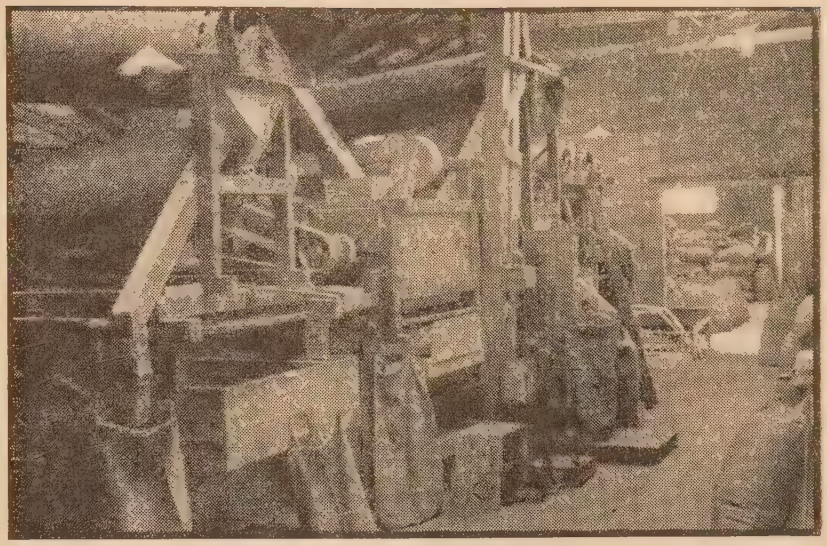
is it expected, that the present embargoes are permanent but even if that should be so, the major markets for New Zealand seeds still remain and are capable of some expansion.

On the other hand, it was the wartime British demand for seeds from New Zealand which caused prices for all grass and clover seeds, whether for local consumption or for export, to reach the high levels of 1945 and 1946. The British restrictions have caused a recession in these prices and, as might be expected, certain lines of seed have suffered even to the extent of becoming unsaleable. With the natural adjustment which must follow any such drastic upheaval, seed prices may be expected to even out on something like a reasonable level before long. Certainly no seed producer will gainsay that prices much below the peak of the past few seasons will still leave a margin of profit to the efficient farmer. On the other hand lower prices will doubtless lead to increases both in local consumption and in the purchases of Australia.

It is to be expected, however, that the low-producing areas which have managed to pay a dividend only because of high prices will no longer be worth saving for seed and that added emphasis will be placed on the necessity of adopting efficient methods of management and harvesting in the small seeds industry.



Impurities of various kinds must be removed from all grass and clover seeds before use. Improvements in machinery and technique of seed-cleaning stores situated adjacent to centres of the industry have led to the production of better samples and reduced loss of good seed to a minimum.

Origin of Industry

Farmers in New Zealand have been producing seed since the early days of European settlement. The climate has limited production to certain areas, some of which have become famous for regional strains of superior quality which have developed during the years. Names of some districts, on the other hand, have become associated with strains of inferior quality. Those facts have had a marked influence on methods of production and on the quality of seed available for sowing.

The Hawke's Bay and Poverty Bay districts, for instance, were long associated with a superior type of perennial ryegrass seed. However, because of the necessity of harvesting seed from old areas to maintain that type, a limit was placed on the capacity of those districts to produce seed. Other districts, where pastures of long duration were the exception rather than the rule, were able to produce ryegrass seed much more cheaply, but pastures were frequently sown with a mixture containing both perennial and Italian ryegrass and repeated harvesting and resowing of seed from those areas led to the development of inferior strains of ryegrass. Similarly, the Akaroa district, where cocksfoot seed was sown in the days of early settlement and the areas so established were not broken up, became famous for the type of cocksfoot produced there. To be certain of purchasing seed of Akaroa strain buyers were prepared to pay the higher prices resulting from the necessity of hand harvesting on the hills where the seed was produced.

Seed Quality

The past 25 years have brought many changes in the pasture seed industry. The introduction by the Department of Agriculture of a seed certification scheme to identify lines of seed of superior strain has not only assured the buyer of Certified seed as to the type he is purchasing but has also led to improvement in the general quality of seed being marketed. It has also had an indirect but far-reaching effect on seed production in different areas and has enabled methods of production to be employed which were not previously possible without grave risk of deterioration in the types of the various species.

Coupled with the operation of this scheme, which was at first concerned only with superior strains developed under natural conditions, has been the work of the Grasslands Division of the Department of Scientific and Industrial Research, Palmerston North, in selecting by scientific methods improved strains of the main grass and clover seeds. Today the pedigree strains released by that division provide the basic material for seed coming under the certification scheme. This in turn has enabled the seed grower to take advantage of the increased seed yields associated with young pastures and to engage in the production of seed of superior strain even though his farming programme does not permit the retention of individual areas in pasture for lengthy periods.

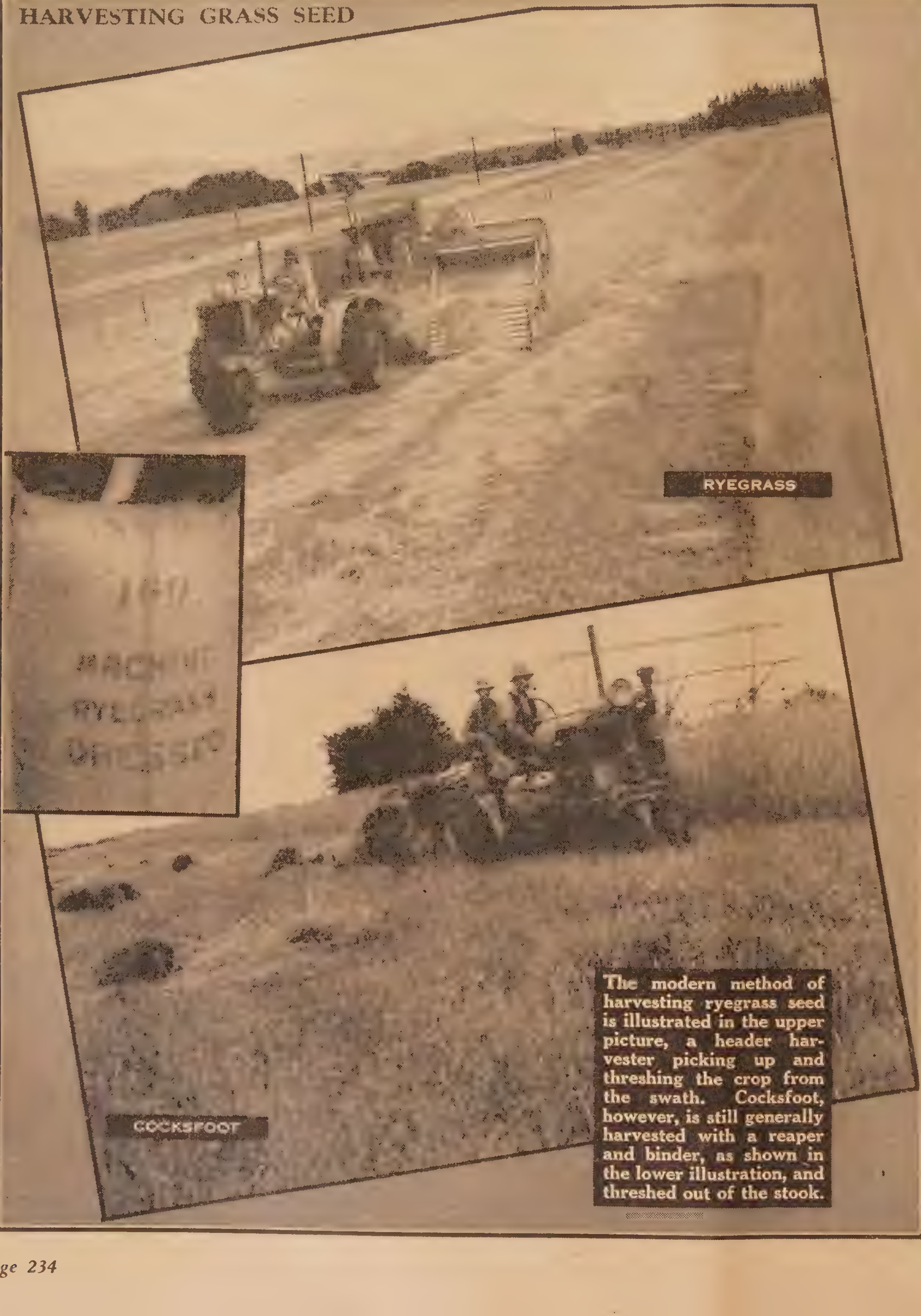
Purity and germination of the seed, like strain quality, are of greater importance than bushel weight and colour. Seeds of excellent appearance may nevertheless be dead, and the value of a line is in proportion to the viable seeds present. Impurities may consist of other crop seeds, of relatively unimportant or of serious weed seeds, and of inert matter, all of which affect the value of the seed comprising the bulk of the line.

Twenty years ago the seed-testing station of the Department of Agriculture handled about 10,000 samples a year; in 1947 the number reached 49,000. That increase indicates not merely greater appreciation of a knowledge of the purity and germination of a line of seed but also that practically the whole trade in pasture seeds is based on the purity and germination of each individual line.

Harvesting Methods

Many changes have taken place in farming practices generally during the past 25 years, and not the least have been those relating to the saving of grass and clover seeds. The introduction of the header harvester has revolutionised methods of seed harvesting and has led to the operation being carried out with a minimum of delay.

HARVESTING GRASS SEED



The modern method of harvesting ryegrass seed is illustrated in the upper picture, a header harvester picking up and threshing the crop from the swath. Cocksfoot, however, is still generally harvested with a reaper and binder, as shown in the lower illustration, and threshed out of the stook.

Whereas older methods entailed transport of the crop to a stationary thresher and frequently necessitated stacking until a plant was available, most crops are now harvested by a header harvester following the swath left by the mower, and even in some cases by direct heading. In the wake of this development numerous problems have arisen which are exercising the mind and ingenuity of the seed grower.

All grass and clover seeds require cleaning before use to remove impurities of various kinds. Improvements in seed-cleaning machinery and technique have led to the production of a better sample of seed while reducing loss of good seed to a minimum.

For many years New Zealand has produced seed of all but three of the grasses and clovers widely used in pasture mixtures in this country, but paspalum and subterranean clover seeds have come from Australia and timothy seed from the United States of America. In view of the climatic conditions in districts where paspalum thrives, locally-grown seed of this species is very unlikely to replace imported seed.

Limited quantities of subterranean clover have been grown in New Zealand for a considerable time, but in the past few years interest in local seed production has increased. The harvesting of this crop presents a major problem but there are indications that it is being overcome by growers. If that can be done, there is no reason why subterranean clover seed should be imported.

Threshing ryegrass seed. The method of earlier years required the crop to be carted to a stationary threshing mill.

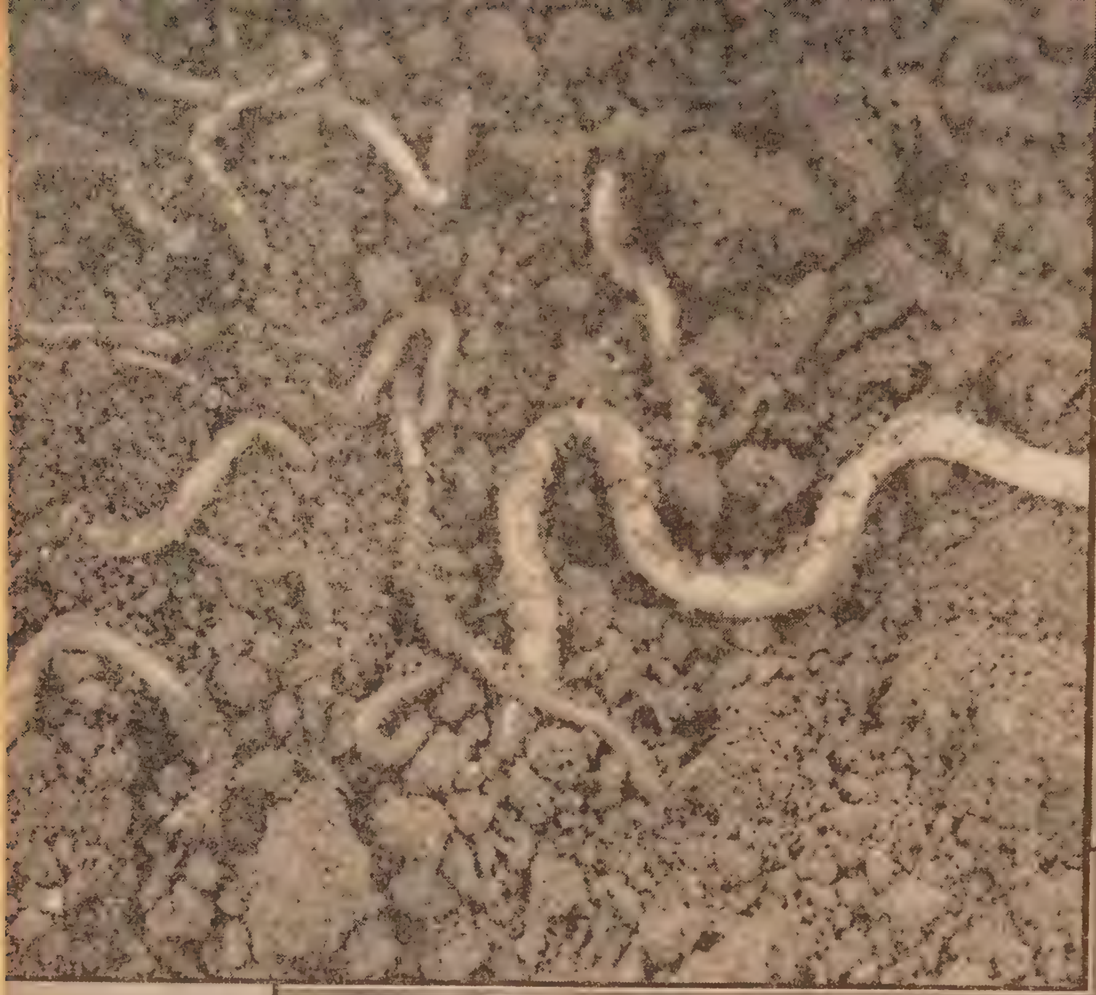
Until the war years very little timothy was saved in New Zealand, but in 1946 production was sufficient to meet the present requirements for sowing. An added incentive to the continuation of local production is that, whereas seed of imported origin is of inferior type, there is now available in New Zealand an appreciable quantity of seed of a markedly-superior strain which receives recognition under the certification scheme. Once this strain becomes known to farmers generally there is every reason to expect that the use of timothy seed in pasture mixtures will increase. The potential production of timothy seed in this country is capable of taking care of any increased local demands and of meeting any export market that might arise.

Change in Farmers' Attitude

Not the least notable feature of the trend in grass and clover seed production is in the attitude of the farmer to this activity. The production of Certified seed has not only given the grower more paying returns and encouraged him to sow better strains of seeds, primarily with that end in view, but has also led to the establishment of better pastures and improved carrying capacities. Particularly is that so in districts where inferior strains have developed in the past and where, as a consequence of improved pastures, increased fertility of the soil and better crop yields are also being experienced. As a reaction to the other developments many farmers have come to recognise a place in their farming programmes for the production of grass and clover seeds.

In many districts seed harvesting in earlier years was regarded primarily as a method of using surplus growth and to be undertaken "in a favourable season." Now, however, it is regarded as a normal part of farming activity and comes into the planning of the farm programme in the same manner as does the growing of wheat, for instance. Better management practices have arisen, and the sowing of grass and clover seed is changing from the haphazard undertaking of past years to the planned industry being revealed today.

The handling of sacks of seed in store is facilitated by electric stackers. The Dominion yield of grass and clover seed in the 1945-46 season was over 40,000,000lb.



SOIL RICH IN HUMUS ENCOURAGES WORMS

COMPOST TEN WEEKS FROM COMPLETION OF HEAP

COMPOST FOR THE HOME GARDEN

By **A. McKECHNIE,** *Fruit Inspector, Wellington.*

THE ability of garden soil to produce successive crops depends upon its fertility, and this article shows the benefits to be derived from the conservation of animal and vegetable wastes and their return to the garden. Many home gardeners already make compost, but unless the operation is carried out in the correct manner the result is sometimes disappointing. Many soils are more or less deficient in organic matter, and the addition of well-prepared compost provides organic matter in a form which is of immediate benefit to plants, and is one of the means by which the gardener may increase the fertility of his soil.

ORGANIC matter may also be provided by growing and turning under green crops, but there are some disadvantages with this method. During decomposition of the green crop biological and other soil energies are engaged on the "breaking down" of the crude organic matter; much of the soil nitrogen is utilised in this process and becomes temporarily unavailable for plant growth. The acidity developed during the decay of the green crop is likely to retard plant growth, and it is unwise to sow or plant where a green crop has been turned under until sufficient time has elapsed for the main decomposition process to have been completed; this may take several weeks, according to the time of the year at which the green crop is turned into the soil.

Many home gardens are intensively cropped and the growing and turning under of a green crop cause an inconvenient break in the cropping programme, which may be avoided by using composting as a means of adding humus to the soil.

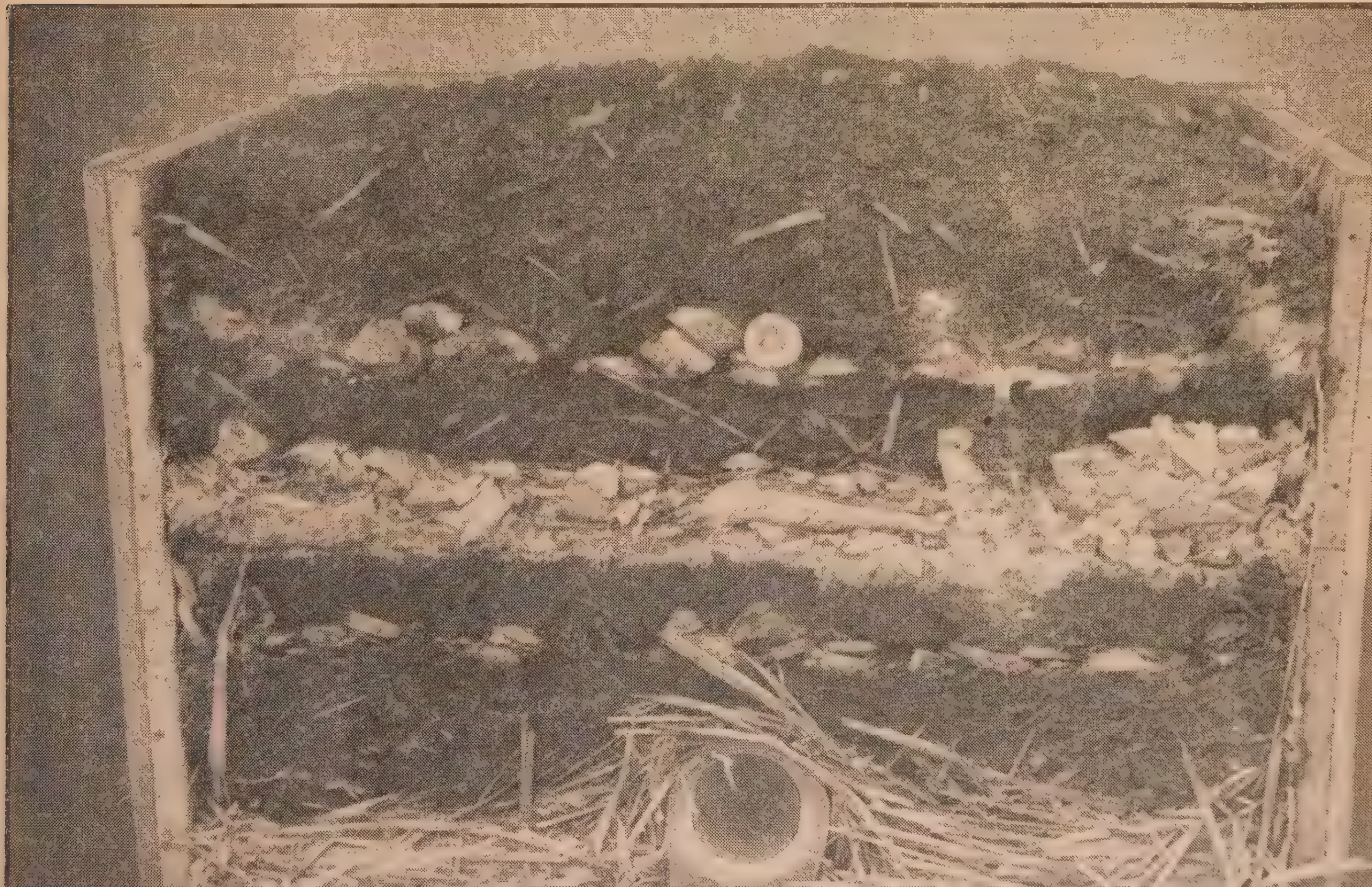
Animal and vegetable refuse are valuable sources of plant food which can be reduced to a suitable condition for application to the soil by using comparatively simple methods of composting easily adapted to the limitations of most domestic gardens. Bacterial action soon breaks down these organic substances into friable humus rich in plant food.

A properly-managed compost heap will not be a nuisance through the breeding of flies or because of unpleasant smells. It consists of an accumulation of every type of waste from the garden, kitchen, and any place where refuse is likely to gather. All wastes from the kitchen, such as egg shells, peelings, crusts and crumbs of bread, fish bones, wood ash, etc.—the greater variety of wastes the better—should be gathered and built into the compost heap.

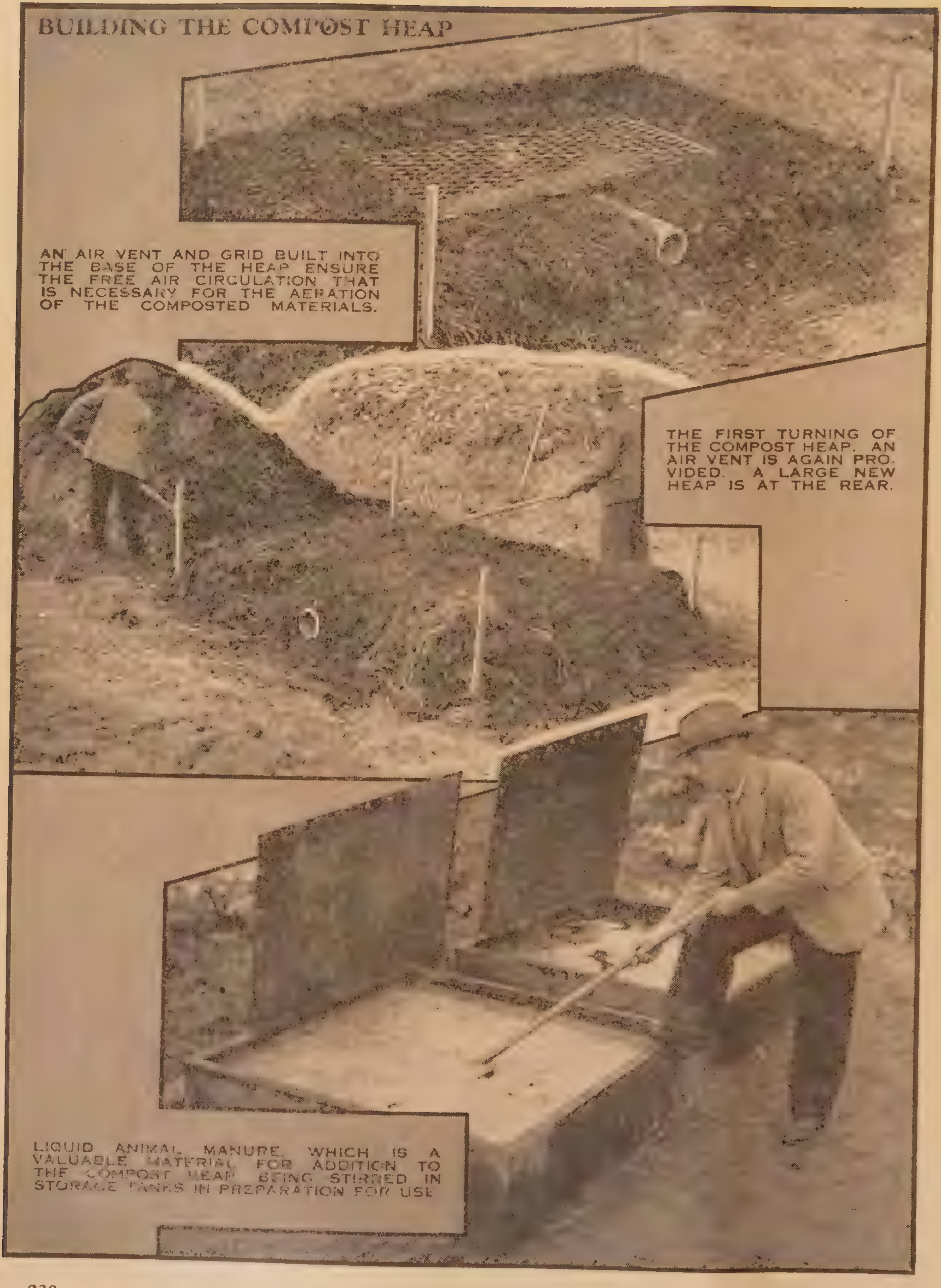
In home gardens where the supply of suitable material for compost is rather limited bins or boxes are recommended, as small compost heaps in the open are not very satisfactory. These containers assist the decomposition of the material by maintaining the heat in the matter being composted and are also a means of maintaining tidiness and are an added protection from the weather. A box 12ft. long by 4ft. wide by 4ft. high is suitable for handling considerable quantities of composting materials. The box is divided into three compartments, the two inside

Below—Model of cross-section of compost heap showing air vent in base, layer of straw, manure, vegetable refuse, earth, carbonate of lime, vegetable refuse, manure, earth, vegetable refuse, and the final layer of earth.

[*Photographs below and on opposite page by Sparrow Industrial Pictures Ltd.*



BUILDING THE COMPOST HEAP



AN AIR VENT AND GRID BUILT INTO THE BASE OF THE HEAP ENSURE THE FREE AIR CIRCULATION THAT IS NECESSARY FOR THE AERATION OF THE COMPOSTED MATERIALS.

THE FIRST TURNING OF THE COMPOST HEAP. AN AIR VENT IS AGAIN PROVIDED. A LARGE NEW HEAP IS AT THE REAR.

LIQUID ANIMAL MANURE, WHICH IS A VALUABLE MATERIAL FOR ADDITION TO THE COMPOST HEAP BEING STIRRED IN STORAGE TANKS IN PREPARATION FOR USE

[*Sparrow Industrial Pictures Ltd. photos.*

partitions and the boards at one end being removable to facilitate handling of the compost through successive stages (see diagram on this page). A roof or covering of some description should be used to protect the heap from excessive moisture and also from the sun's rays. If the box is of much smaller dimensions than those suggested, the materials may be handled more easily if the compartments all have removable fronts instead of slotted dividing walls as illustrated.

Compost heaps may also be built in the open or against a wall, but such unprotected material will lose some of its value and will be less uniformly and rapidly decomposed.

Building the heap on a concrete or wooden floor is not advisable, as this leads to loss of heat and aeration and slows down the rate of decomposition.

Composition of Heap

Compost heaps are built on the principle of a sandwich either square or rectangular in shape. As the material becomes available the following heap is built: Six inches of mixed organic matter, 2in. of animal or poultry manure, and a layer of soil, containing wood ash wherever possible, and a liberal dressing of carbonate of lime. The layers of mixed organic wastes, manures, earth, and lime are repeated until a height of 4ft. is reached. The final layer of manure should be twice the thickness previously used, followed by a layer of soil approximately 3 to 4in. thick. This thick layer of soil serves as an additional protection against deposits of eggs by flies, and if shaped like an inverted "V" will prevent excessive moisture from entering the heap, even though there is no roof or other covering.

Any material known to be affected with serious disease or which is hard and woody should be burnt and the ashes added to the other wastes. If animal or poultry manure is not available, blood and bone or fish meal at the rate of 28lb. a cubic yard will serve as activators.

Size of Heap

Large heaps are more satisfactory than small heaps, and a desirable minimum size of a heap when first built is 4ft. high by 4ft. wide and not less than 4ft. long. This will sink to about 2ft. 6in. high before turning is necessary. If the heap is smaller, the ratio of cooling surface to the volume is too great and the lapse of time before maturity is reached is too long. However, as the home gardener seldom has sufficient refuse to build a large heap in a reasonable time, bins or boxes are recommended.

Aeration of Heap

As aeration plays an important part in composting, the heap should be made as loosely as possible to permit adequate air circulation. An open base is advisable and a generous layer of hedge clippings or straw may be used for this purpose. A length of drainpipe or downpipe (see diagram) is an added advantage in letting air into the bottom of the heap; pipes should be laid on the ground running from the outside of the bin to the centre. Care should be taken while building the heap not to walk on the work already done, as this packs the material and hinders free circulation of air.

Aeration can be greatly assisted by making vertical funnels having a diameter of about 4in. in the heap with a crowbar or shovel handle pushed in from above. These funnels should be spaced at intervals round the heap 1ft. in from the sides. When completed the material is left for about three weeks, during which intense fermentation takes place and the temperature usually rises to about 150 degrees F.

First Turn

The first turning of the heap may be made when the temperature inside the heap has dropped to about 100 degrees F. If the turn is made too early, heat lost during this operation will not be regained and the process of decay will be retarded considerably. With the smaller heaps generally prepared by the home gardener, the material is usually ready for first turning in from 4 to 6 weeks in summer and 6 to 8 weeks in winter.

A clean space or another bin is necessary at the end or side of the original heap for the operation of turning, which is done by bringing the outside of the heap to the inside of the new heap, in which funnels are again bored. With this turn the temperature will again rise and the material gradually becomes dark and crumbly.

Second Turn

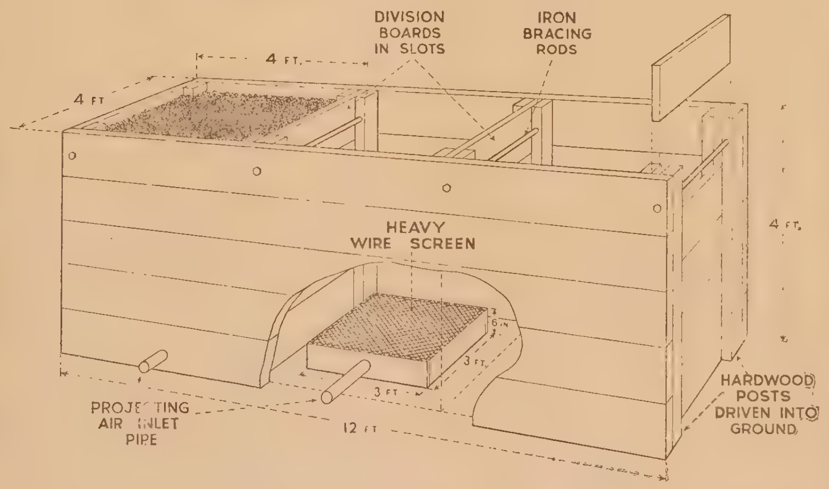
When the heap has become well rotted a second turning is made to bring the outside to the inside of the new heap, but this time no funnels are necessary. Slices 6in. thick are easily cut off and turned.

Completion and Management

Compost may be applied to the soil for surface mulching when about half rotted, but it is better left until maturity is reached, that is, when all the material has become sweet smelling and dark brown and has lost any resemblance to the materials of which the heap was first built. This material requires protection from excess rain, but the possibility of dryness must not be overlooked. If the material does not contain enough moisture, water or, better still, liquid manure should be added through the rose of a watering can.

During summer compost must be tested periodically for moisture content, which can be done by inserting the smooth handle of a hoe or rake into the heap and allowing it to remain for a few seconds. If the handle when withdrawn is found to be wet or slimy, the moisture content is too great; a dry handle shows that more

SUITABLE BOX FOR MAKING COMPOST



The raw material is put in the left-hand compartment, the first turn is made into the centre box, and at the second turning the compost is put in the right-hand section for its final stage. Partitions and the end of the last section are of removable boards in slots to facilitate handling. The box is on bare earth with no floor. In the centre compartment is a wooden frame covered with strong wire mesh with an air pipe leading into it from outside the main box.

THE MAKING OF COMPOST

[*Sparrow Industrial Pictures Ltd. photo.*

A compost heap during building. When water is necessary it should be applied as a fine spray to ensure even distribution through the heap.

water is required, while one carrying fine particles of the material denotes a satisfactory moisture content. Discretion is necessary when watering. Evenly-distributed moisture is possible only in a thoroughly-mixed heap, to which water should be added until the material is of the consistency of a squeezed sponge.

When the finished product is not to be used immediately, but is to be stored for a time, it should be kept on an earth floor and covered with moist sacks. During prolonged storage periodical turning is advisable.

The prevention of larvae of flies feeding on the heap is secured by the use of liquid larvicide. The top of the heap is soaked to a depth of 2in. with this preparation, which consists of 5oz. commercial sodium arsenate and 7 fluid ounces of molasses to 4 gallons of water. Alternatively the heap can be sprayed with D.D.T., which will kill most of the flies, or kerosene may be sprayed on the heap at intervals to prevent flies from laying eggs, but this will not kill eggs or larvae already located before spraying is done. Avoid using disinfectants for this purpose.

Application of Compost to Garden

When ample supplies are available compost should be broadcast over the whole garden at the rate of about 4lb. a square yard; larger quantities can be used if supplies are plentiful.

Compost distributed in seed rows from 2 to 4in. deep is conserved and at the same time deposited where the plants benefit most by its application. If the compost has been thoroughly prepared there seems to be little difference in results from plants and seeds placed directly on top of the compost and those where the material has been covered with soil.

For seed boxes or potting plants compost screened through a fine-mesh riddle is excellent if used as an ingredient of the John Innes seed-sowing or potting mixtures, but it is not suitable for use by itself for this type of work.

Advantages from Use of Compost

Among the advantages of adding organic matter to the soil by humus derived from compost are:—

1. The decomposition processes are largely completed in the compost heap and, provided sufficient lime was used in the preparation of the heaps, no acidity is caused when the finished product (humus) is added to the soil.

2. The plant food in the humus is immediately available for plant growth.

3. No temporary nitrogen starvation occurs following application of properly-prepared compost.

4. Composting is an excellent method of disposing of waste vegetable matter, kitchen refuse, etc., and converting it into humus.

5. Earth worms attracted and encouraged to breed by compost help in increasing the fertility of the soil.

6. During dry periods the moisture is held in the soil, yet when an excess of moisture occurs the soil is kept open and does not become puggy.

The illustrations in this article show the general method of composting, and though the heaps shown are too large for the home garden, they give an idea of the extensive composting being done by large institutions such as the Mental Hospital, Point Chevalier, Auckland, to whom acknowledgment is made for permission to take the accompanying photographs. The large quantity of compost made annually in this hospital garden greatly assists in the production of healthy vegetable crops.

[*"Evening Post" photo.*

The benefits to be derived from the conservation of animal and vegetable wastes and their return to the garden in composted form are evident in healthy, succulent vegetables and continued productivity of the soil.

SUBTERRANEAN CLOVER IN HAWKE'S BAY

Fertility and Carrying Capacity Raised Over Wide Area

By R. P. HILL, *Fields Instructor, Hastings.*

SUBTERRANEAN clover *(Trifolium subterraneum)* has been the means of raising to a very great extent the carrying capacity of quite a considerable area of land throughout Hawke's Bay. The soils of these areas include the fertile loamy soils of the yellow-grey loam group and the light soils of low natural fertility belonging to the yellow-brown loam and pumice groups. As the annual rainfall of 35in. to 40in. is badly distributed and the areas are subject to long dry spells in summer, white clover will not persist and perennial ryegrass will not thrive without the association of a vigorous clover. On these areas it has been found that with small annual dressings of superphosphate subterranean clover has been well established and persists by reseeding.

WITH subterranean clover established and fertility built up, perennial ryegrass, cocksfoot, and crested dogstail have also been established, and as time went on it was possible also to grow white clover. Consequently lands which originally would carry barely one dry sheep to the acre are now making a substantial contribution to the increased production needed for Britain and are carrying from 3 to 5 ewes to the acre and fattening the lambs. The aged ewe is also turned off fat to the works shortly after weaning.

Characteristics of Plant

Subterranean clover is a low-growing to upright annual. Its seed germinates with the advent of autumn rains and the plant makes good growth in the autumn, steady growth throughout the winter, and maximum growth in the spring, eventually flowering and seeding in November and December. Its seed is contained in a husk with hooks on it which, when ripe, is usually buried in the ground, the parent plant dying off completely.

Subterranean clover shows very little green growth after Christmas, but if it is not grazed too closely, the dry leaves and stalks provide good nutritious fodder for stock. Subterranean clover provides nothing in summer other than this dry feed until the seedlings germinate with the first rains of autumn. However, all ewes having generally been sold as fat, the country is relatively lightly stocked until the new growth appears.

This is the position on farms where subterranean clover is the only ingredient of the pasture, but on the majority of farms where subterranean clover was originally established it has now been found possible to grow perennial ryegrass and other grasses which will provide a certain

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Photograph in heading by National Publicity Studios.

SUBTERRANEAN CLOVER IN HAWKE'S BAY

A valuable feature of subterranean clover is its ability to spread rapidly by runners, from which many flowers are produced.

amount of feed—sufficient at least to carry the nucleus stock—during these dry months. The advantage of this clover is that it enables the farmer to stock up in the autumn again with ewes, knowing that he can carry them through the winter; he knows also that he will have sufficient feed to carry the increased population after lambing right through until the lambs and their mothers are fattened.

Methods of Establishment

Subterranean clover may be established by two methods. The method now most generally adopted on ploughable land is to plough the land and include 2 to 3lb. of the seed in the grass seed mixture when sowing down to pasture in the autumn. The second method, which was very widely adopted in the early days of its introduction and is found very satisfactory on steep land difficult to plough, is to broadcast 3 to 4lb. of seed in the autumn on existing pasture.

It is, however, most important to add phosphate when sowing the clover seed; it is usual to add the seed to the phosphate when topdressing. On light land subterranean clover grows better with light annual applications of phosphate.

The land may be harrowed with a tripod and chain harrows at time of sowing, but this is not essential if the pasture on which it is sown is not grazed bare before sowing. However, if the pasture is not to be harrowed, there should be several inches of growth so that the seed may germinate and make its first growth under cover of the roughage and grass; otherwise it may be eaten by small birds before it has reached the two-leaf stage.

Care must also be taken with the stocking of subterranean clover in its first year in order to allow it to reseed, and in the first year sheep should not be grazed on it while it is in the flowering stage. As it is an annual, its persistence depends on its reseeding. After its first year of establishment the same precautions need not be exercised.

Its Use Spread Rapidly

It is estimated that in Hawke's Bay fat lambs are raised on at least 200,000 acres of subterranean clover-dominant pastures established on ploughed land and on a further 200,000 acres on which subterranean clover introduced by surface topdressing is an important constituent of the pasture. The main subterranean clover areas lie between the Ngaruroro River and Takapau in the western half of Hawke's Bay and east of the main ranges. The subsidiary areas extend north-north-east of this belt to Wairoa and smaller areas occur near the coast east of Hastings.

Subterranean clover is believed to have been first introduced on a large scale in Central Hawke's Bay by Mr. Jas. Caldwell of Springhill in 1925 and soon after by Messrs. Worsnop Bros. and others. By 1930 it had become quite widely known in the district. From then its use has spread until it now predominates in practically all the areas suitable for its establishment. It is also an ingredient of pastures on practically all hill-country farms where fat lambs are raised. Its inclusion in the sward ensures for ewes and lambs a succulent early growth not provided by other plants. On the moister flat lands and heavier hill lands with a higher rainfall white clover grows so well that subterranean clover is crowded out, and in fact is not required.

The bulk of the seed sown is the Mt. Barker strain, which provides earlier feed than the Tallarook strain, which is 2 to 3 weeks later but provides as much feed in the late spring.

A SUBTERRANEAN CLOVER FARM

The value of subterranean clover is shown by the experience of Mr. G. W. Limbrick, who in 1934 purchased at Tikokino 100 acres of light flat land with a stony subsoil, but very soon found that this area was too small to maintain him and his wife and family. He was convinced by what he had seen that with the use of subterranean clover this initially-poor country could be made to produce much more, and by 1936 he had increased his holding to 290 acres and by 1941 to 358 acres.

When he began farming the Tikokino property the land would carry barely one dry sheep to the acre, but today it is carrying approximately 4 ewes to the acre and fattening all the lambs, in addition to running 50 to 60 head of growing cattle. At present 1400 ewes are carried.

The light land is susceptible to wind erosion while under cultivation, and shelter belts of macrocarpa and *Pinus radiata* are provided in all paddocks.

Establishment Programme

The programme was first to broadcast subterranean clover at 2lb. an acre over the poor native grasses comprising the pasture, at the same time topdressing with 1½cwt. of superphosphate to the acre. Progress by this means was slow, though it allowed some breeding ewes to be carried and a small herd of cows were milked.

Eventually an annual programme of ploughing up approximately 30 acres and sowing down to soft turnips was adopted. The following year the area would be sown in chou moellier and the third year the paddock would be sown to grass, the seeds mixture being 1½ bushels of oats, 25lb. of perennial ryegrass, 2lb. of white clover, and 3lb. of subterranean clover an acre. In this way the whole area has been regrassed at least once. The oats are drilled in before the grass seed is broadcast.

Though oats are not sown by all farmers, Mr. Limbrick is convinced that it pays him to sow them, particularly for the extra winter feed they provide; the oats also shelter the young grass on land subject to wind erosion, and the extra stock carried during the feeding of the oats is conducive to better consolidation of the land. On this type of land it is a practice which may be recommended.

Realising the value of supplementary feed in the winter, Mr. Limbrick still breaks up at least 30 acres of pasture every year and sows the area in soft turnips and/or chou moellier. He is convinced that in seasons of drought or particularly severe winters he would not be able to carry and fatten all the stock he does without supplementary feed. Consequently his farming programme is adjusted according to the seasons. Even during the big drought of 1945 he was able to maintain his stocking and buy in his replacements at the usual time (February), and though he was short of feed the autumn rains came in time to save the situation.

Stock Management

An outline of the stock management programme is as follows: In February four- and five-year ewes are purchased. (On this type of pasture young ewes are inclined to become too gross.) On subterranean clover-dominant country it has been found that unless supplementary feed is grown there is more trouble with sleepy sickness, and consequently Mr. Limbrick prefers not to carry through for several years with young ewes, nor does he breed his own replacements. Ewes are dipped after purchase.

Mixed-age Southdown rams are mated on March 1 (1 ram to 70 ewes) and are left out until the end of April, when the ewes are left alone on the grass paddocks under set grazing. Movement of sheep takes place only according to how the feed holds out; more ewes are put into a paddock or taken out as required.

Crutching is done in May or June. As every care is taken that only healthy ewes are bought, no drenching of sheep is required, only late lambs being drenched occasionally.

In June the poorest ewes are given the run of the chou moellier or turnip crop, other light ewes are put on to a break of chou moellier at about 100 to the acre, and the balance (about half) of the flock are run lightly on pasture, the number per paddock depending on the feed available. All ewes on crops are drafted once a week and every ewe is taken off a week before lambing and put on grass, where all ewes are lambed down. They are also taken off the crop on to grass every night and fed a ration of hay. Sheep on grass are fed hay only if there is snow on the ground, which is not unusual in winter.

As each ewe lambs it is put with its lamb on to a fresh grass paddock where it remains until the lamb is ready for the works. The management through the spring is the same as that in the autumn, the number of ewes and lambs in each paddock being regulated to the amount of feed available.

Lambing begins at the end of July and about 75 per cent. of the lambs go to the works in the first draft of fat lambs in December. The balance are sent away in January and the ewes shortly after. Shearing of the ewes takes place immediately after the first draft of lambs goes away.

Fifty to 60 in-calf run cows bought in in mid-winter are kept until they have calved and the calves are sold as runners. The cows are also sold fat. Cattle are used as an adjunct to sheep in pasture management and pay handsomely. Extra lambs and sheep are bought in to fatten when feed is too plentiful.

Very little bearing trouble is experienced and there is virtually no foot-rot; mortality of ewes is low and varies only according to the percentage of older ewes bought.

The use of subterranean clover has raised the productive capacity of much of the fertile but low-rainfall areas of Hawke's Bay.

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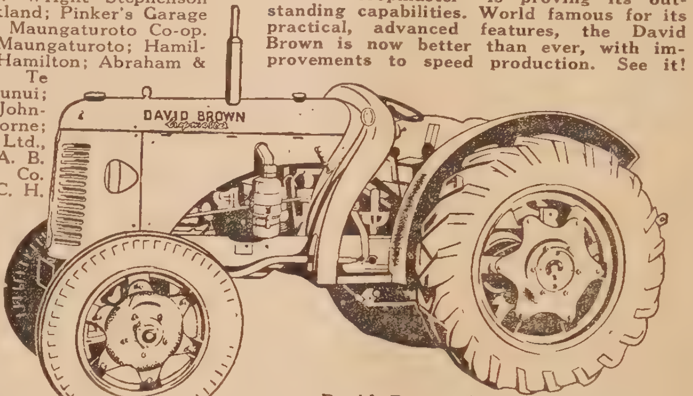

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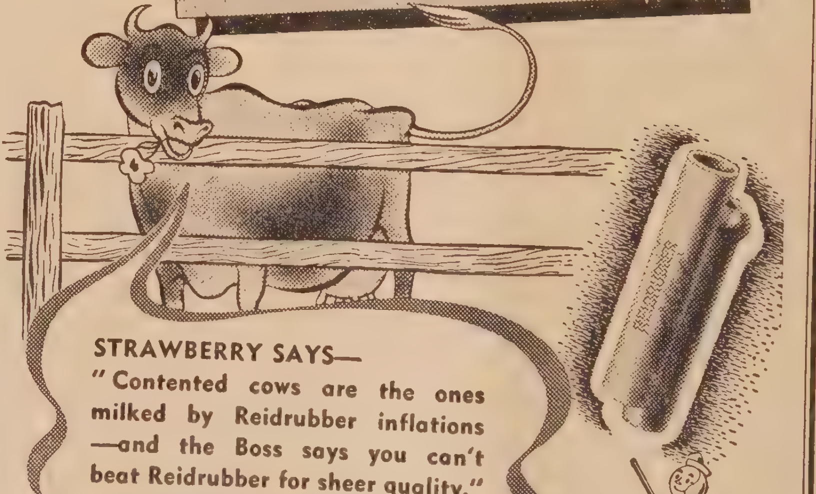

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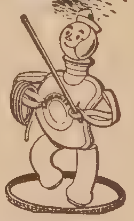

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Pasture and Crops

All pastures are topdressed in autumn with 1½cwt. per acre of serpentine superphosphate or superphosphate if serpentine is not available.

Chou moellier, which is favoured as a winter crop, is sown in November. Mr. Limbrick considers the Imperial Green Globe soft turnips sown in February more palatable than the Hardy Green Globe. If sowing is delayed until March, Purple Top Mammoth are favoured.

About 15 acres of hay are saved annually, the yield from subterranean clover-dominant pastures averaging 2 tons an acre.

The farm is well watered, troughs in all 18 paddocks being reticulated to a bore and deep well pump. The largest paddock is 30 acres.

New pastures are sown in March, the mixture generally used being as follows: 1½ bushels Algerian oats, 25lb. Certified perennial ryegrass, 5lb. Certified cocksfoot, 2lb. Certified white clover, 3lb. subterranean clover (Mt. Barker strain), a total of 35lb. per acre of grass and clover seed. In recent years the mixture has been reduced to 32lb. by eliminating the subterranean clover, there being already sufficient seed in the ground.

Once subterranean clover is properly established it will flower and set seed satisfactorily even under comparatively close grazing.

Fat Stock Disposals

An indication of the progress made since the early years of Mr. Limbrick's occupation of the property, when it was carrying less than 1 dry sheep to the acre, is contained in the following killing returns of fat sheep to the works from 1938:—

FAT STOCK DISPOSALS, 1938-46

Year	Lambs	Sheep	1st draft Lambs	Average weight first draft lambs lb.
1938	963	138	643	Not known
1939	848	219	674	Not known
1940	947	163	642	40.87
1941	1315	86	979	38.36
1942	1538	276	963	35.61
1943	1611	639	877	39.76
1944	1196	356	825	38.23
1945	1117	259	802	34.67
1946	1149	358	900	41.38

There was an exceptional drought in 1945 and other seasons during the period were unsatisfactory, but the average weights for first drafts have always been good. These figures are freezing works figures and take no account of other fat sheep sold for which records are not available, nor do they take into account the annual average of 55 fat cows and 55 fat calves sold in the yards.

The variation in the number of grown sheep sent to the works throughout the years is accounted for by the fact that ewes are culled according to the state of their teeth and not entirely by age. Some lines of four- and five-year-old ewes bought in have better-preserved teeth than others, and from such lines the numbers culled out for teeth and sold fat are smaller. Under Mr. Limbrick's management it is rare for as many as 400 ewes to be bought in each year.

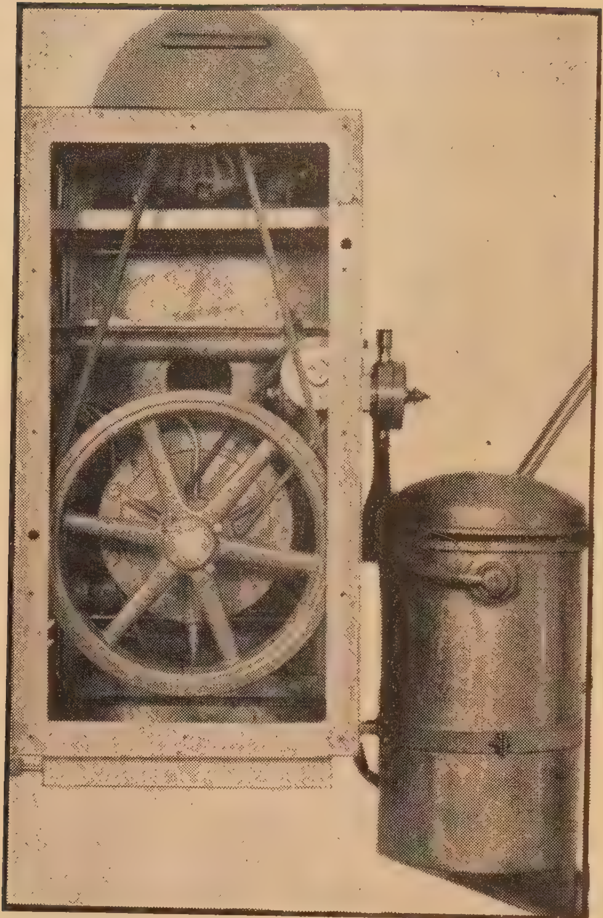
The land from which this stock is sold is very light and poor in its natural state, being of a sandy type with shingle 2ft. or less from the surface. The farm provides an excellent example of what the use of subterranean clover, coupled with good management, has done, and conditions and management on it are typical of those on many more flat land farms in Central Hawke's Bay.

The succulent, leafy growth of a well-established subterrannean clover pasture in the drier area of Hawke's Bay.

Mounting the Milking

By W. G. WHITTLESTON, *Physical Chemist, and*
D. J. ALLEN, Technician, Animal Research Station,
Ruakura.

IN the average cowshed one of the dirtiest places is around the vacuum tank. The reason for that is obvious, as a well-oiled pump oozes oil continuously, and so the mounting board, the adjoining wall, and the floor beneath soon become covered with a layer of dust and oil. This article describes an attempt to eliminate the messiness of the pump and certain other defects in the orthodox pump set-up.



The unit with the front panel removed.

MOUNTING the rotary vacuum pump with the ports at the top has become conventional. There is no obvious reason for that system and it has the disadvantage that any moisture condensing in the pump collects at the bottom in a pool, which can cause marked corrosion when the pump is left standing between seasons. If the pump is mounted upside down, the exhaust port acts as a drain and stops this effect. When the pump is mounted thus it becomes easy to mount the electric motor on a tilting platform immediately above the pump and to put below the pump a drip tray which drains via a small tube into the pump exhaust pipe. Such an arrangement is readily mounted on the wall of the shed, and when surrounded by a sheet-iron case makes a neat, clean arrangement which does not drip oil and which provides the motor with good protection against water, so that the separator room can be hosed down without danger to the milking machine motor.

Successful Trial

The inverted pump mounting which has been under trial at Ruakura for some time with successful results is shown in the accompanying drawings and photographs. Fig. 1 shows the unit viewed from the front. The motor is mounted on a tilting base, the height of which is adjusted by a simple screw. The exhaust pipe is bent as shown so that the oil draining tube may pass into it from the drip tray (not shown) and thence to the outside. Fig. 2, a side view, illustrates more clearly the belt-adjusting screw and the drain tube within the exhaust pipe. A plan of the layout is shown in Fig. 3.

The photograph on this page shows the final assembly with the front panel removed. The releaser pulsator drive is built into the pump case (the other pulsators operating from an independent unit in the middle of the shed) and all the lubricators are brought to the outside of the casing for convenience. The photograph on the opposite page

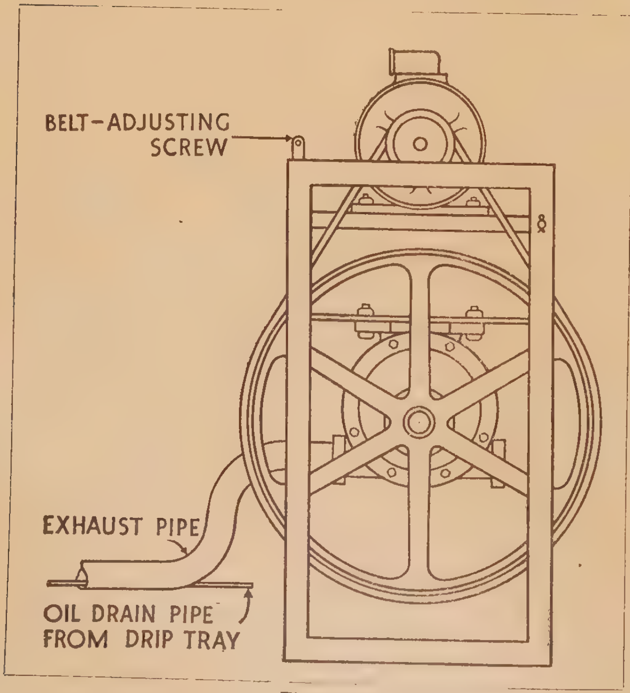


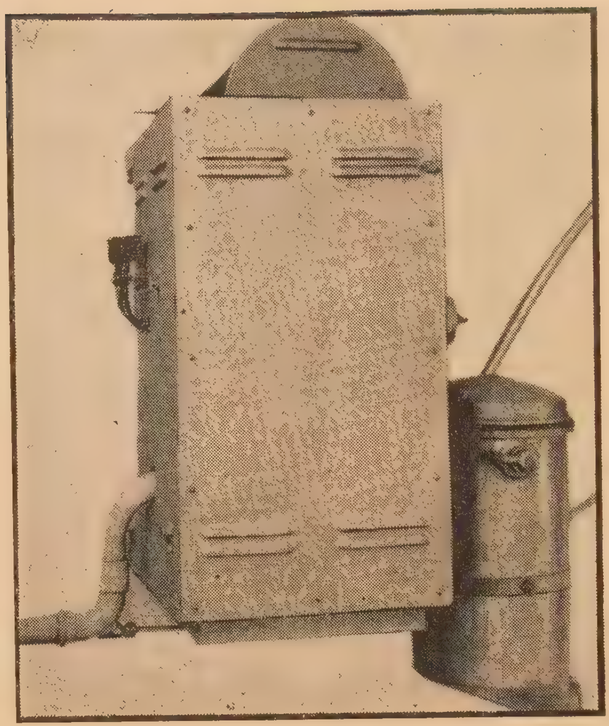
Fig. 1.

Machine Vacuum Pump

shows the case closed up. No overheating of the motor has been experienced, though should that occur, a fan could readily be placed on the motor shaft, so providing ventilation for both the motor and the pump.

Neatness and Convenience

A very neat unit can be made using this method of assembly. The whole unit can be assembled in the workshop and bolted to the wall of the shed at any convenient place. The vacuum tank is included in the unit, so making the very convenient arrangement shown in the photographs. By building pumps with an attached casting suitable for mounting directly on the wall and using a simple, pressed-iron case it should be possible to reduce greatly the cost of installation of the vacuum unit, extend the life of the pump, and improve the cleanliness of its surroundings.



The unit with the case closed.

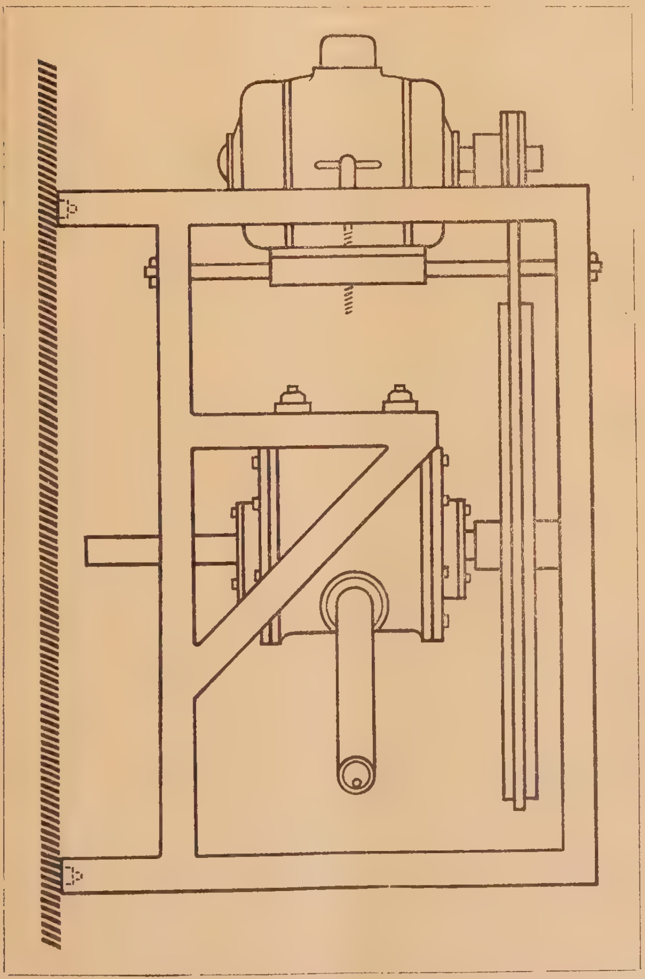


Fig. 2.

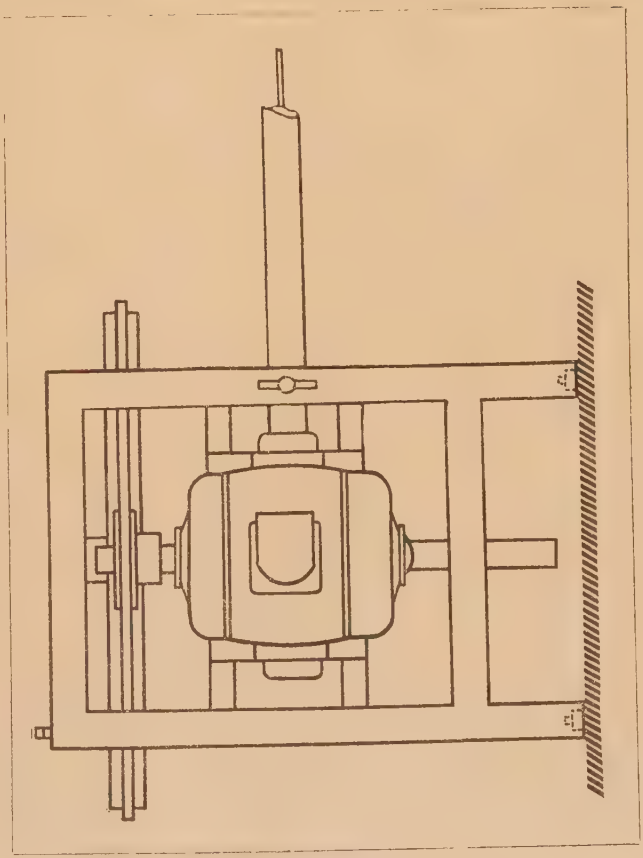


Fig. 3.

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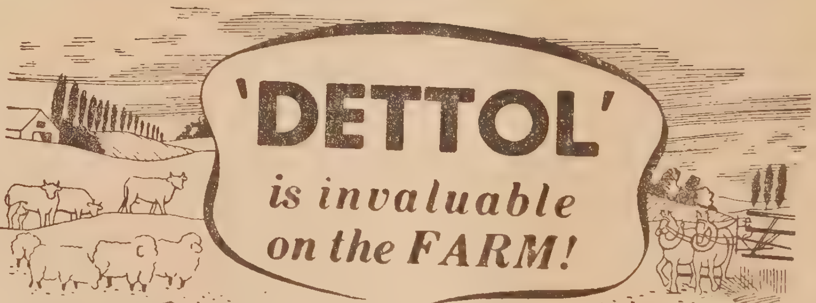
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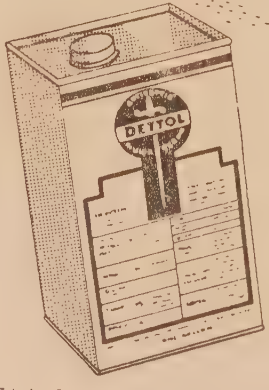

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By W. J. FIX, *Honey Grader, Auckland.*

HONEY grading was instituted in New Zealand to establish standards for the guidance of producers and to enable buyers to purchase honey for any particular market by the description on the grade certificate. Grading is essential to establish the buyers' confidence, and as it is carried out in New Zealand to national standards it facilitates both buying and selling. The graded product commands a high price and ready sale on the open market where ungraded honey is offered.

THE first consignment of New Zealand honey exported was shipped to England by the late Isaac Hopkins in 1884, and was not offered on the open market but was sent as a gift to English merchants to test the possibilities of the market. This shipment failed to meet the requirements of the English experts and buyers, as the honey was white, with a delicate flavour that was no doubt foreign to a market accustomed to honeys of darker colours and more pronounced flavours, so this first shipment of honey to England resulted in an order from a London merchant for one case of 2lb. tins at a price that would not encourage further shipments.

However, it was realised at that early stage in the development of the industry that conditions in at least part of New Zealand were ideal for the commercial production of honey, and that, with land development and the closer settlement that would follow, further areas of country capable of producing good-quality honey would be opened up, resulting in a corresponding expansion of the industry and additional marketing problems. A further attempt to establish an overseas market to absorb the anticipated surplus was therefore made four years later. That effort met with a greater measure of success, and it is safe to claim that the first commercial shipment of honey was disposed of on the English market in 1888.

With the prospect of an assured market, production showed an encouraging increase from season to season, and at the opening of the 1913 season agents in London had contracted to buy 500 tons of honey over a period of three years.

Grading Instituted

The grade and quality exported presented a problem at that stage because of seasonal variations and, to a lesser degree, land development, and the average producer could not maintain the standards set by the agents. To meet the position honey-grading regulations were instituted, and a system of grading that was acceptable to both the industry and the London agents came into operation on December 1, 1915. The original standards have changed little during the intervening years, but to take advantage of modern grading equipment minor alterations in the method of grading have been necessary from time to time.

[*Green and Hahn Ltd. photo.*

The grading of honey supplied to the central depot for the local market is now carried out under three headings, in each case the maximum points being 100: Flavour, which indicates the floral source and value; colour, according to a standard colour scale; and condition, indicating the keeping quality and cleanliness of the pack.

Flavour

Flavour is a difficult characteristic to measure as, quite apart from the variety of flavours representing different floral sources, there is also a wide variation in honey flavours, so to maintain uniformity in grading the value is based on certain standards set by the industry.

For the classifying of honey the flavour is divided into five groups—delicate, mild, medium, pronounced, and extra strong—the divisions between the groups being defined by standard samples. When the honey has been classified it is given a closer description by awarding points for flavour in the group, uniformity again being maintained by standard samples.

Colour

Uniformity in colour is equally as important as flavour, and a standard colour-grading instrument is used. The instrument, known as a pfund colour grader, consists of a wedge-shaped, amber-coloured prism mounted on a metal plate with a correspondingly-designed wedge-shaped clear-glass trough which holds the honey. The plate is moved either way inside a metal frame by a rack and pinion while both the honey in the trough and the prism are viewed through an opening in the frame. A pointer is attached to the moveable plate, and when the honey and the prism match in colour the position of the pointer on the scale registers the colour value.

The colour scale is also divided into five groups—white, extra light amber, light amber, medium amber, and dark amber. Each group is again subdivided to express the colour value more accurately, and points are awarded in each class according to the over-all scale.

The instrument is housed in a small compartment having three walls and a top cover to exclude all outside light. A daylight electric lamp of 200 watts in a fixed position behind the instrument is screened so that the only light visible to the operator passes through the honey in the trough and the prism.

Honey is graded in a liquid condition and for accurate readings must be free from air or cloudiness before it

THE GRADING OF NEW ZEALAND HONEY . . .

is placed in the instrument. Artificial light is used for uniform illumination, as differences in background would create errors in the reading.

Condition

Condition of honey for grading covers its density or water content and freedom from impurities, imprisoned air, wax particles, and pollen grains.

The water content is to some extent a measure of the keeping quality, and under the Honey Grading Regulations the maximum amount of water permitted is 17.2 per cent., or a specific gravity of 1.420. Excessive moisture is readily detected by the general condition of the honey, but to measure the quantity present a Chataway honey hydrometer is used. Honey becomes more fluid as the temperature rises, so the test is made at a known temperature, the hydrometer having a range of from 20 to 50 degrees Centigrade.

This instrument is a combined thermometer and hydrometer which measures temperature and specific gravity at the same time so that the error occurring as a result of the honey cooling while the test is being made may be corrected. The moisture content is expressed in terms of specific gravity or may be translated into the true percentage of water. When the hydrometer is introduced into the honey and the lower portion, which is the thermometer, is completely covered, a layer of water 1/5in. deep is poured on to the surface to prevent the honey clinging to the stem of the hydrometer as it lifts and to give a more accurate surface reading.

The minute particles at times found in honey are not foreign or impure, and under a low-powered magnifying glass are readily identified as either pollen grains or wax particles that have entered the honey from the combs and passed through the strainer. The presence of these particles, either in the body of the honey or on the surface, is undesirable, and to maintain a standard for cleanliness maximum points are awarded only if the honey is perfectly clean.

Results of Grading

New Zealand, in common with other honey-producing countries, has the problem of seasonal variations which affect the quality or grade of honey, but objectionable flavours or natural taints are seldom found. The following analysis, covering honey graded during two seasons, gives an indication of the flavour and colour ranges:

Flavour Group	Range of Points in Group	Number of Cases Each 120lb. net
Delicate	100 — 91	27,160
Mild	90 — 75	3,520
Medium	74 — 61	151
Pronounced ..	60 — 45	Nil
Extra strong ..	40 — 0	Nil

Colour Group	Range of Points in Group	Number of Cases
White	100 — 91	15,217
Extra light amber	90 — 76	10,161½
Light amber ..	75 — 51	5,130
Medium amber ..	50 — 26	322½
Dark amber ..	25 — 0	Nil

Flock House Trainees Show Big Improvement in Physique

WITH 45 trainees and members of the staff who board at the hostel to be catered for, the provision and preparation of meals at Flock House Farm of Instruction, Bulls, require good organisation and planning, particularly with numerous commodities in short supply or unobtainable. The matron, in conjunction with the two male cooks, arranges meals that are ample, nutritionally balanced, and well cooked.

A large garden near the hostel provides vegetables all the year round and an orchard provides fruit in season. All meat is slaughtered on the farm and includes beef, mutton, and bacon. Ample milk is obtained from the farm dairy herd and honey from the farm apiary. A poultry flock provides fresh eggs for eating and cooking all the year round, and surplus birds are used for the table. Fish is served once a week, and in the summer the trainees and instructors often go down to the ocean beach, only three or four miles away, and drag in the surf with nets, frequently catching enough flounders and soles for the personnel of the station.

The physical development of the trainees has an important place in the new training curriculum. The weight and height of each trainee are taken on entering Flock House and every three or four months thereafter. Some amazing increases have been noted; as much as one and a half stone has been put on by a trainee in four months. Recent figures for all trainees in residence showed a gain of 1½in. in height and 9lb. in weight in three and a half months. The aim is not only to teach the boys agriculture but to develop their physique so that they can undertake their tasks with ease.

—*J. H. HITCHCOCK,*
Farm Training Supervisor, Flock House Farm of Instruction.

Radio Broadcasts

RADIO talks to farmers will be given from Station 1YA Auckland at 7.15 p.m. on the following dates:—

April 5—"Current Farming Problems," by E. H. Arnold, Instructor in Agriculture, Whangarei, and T. J. M. Wordley, Assistant Fields Instructor, Whangarei.

April 12—"Farming in Japan," by A. V. Allo, Instructor in Agriculture, Tauranga.

April 19—"The Autumn Management of Young Stock," by I. G. Watt, Veterinarian, Department of Agriculture, Auckland.

April 26—Young Farmers' Clubs session, by a representative of the Waikato district Y.F.C. committee.

Farm news sessions are broadcast over main national stations every Thursday at 9.20 p.m.

Growing Tree Stocks For Shelter Planting

By M. SUTHERLAND, *Farm Forestry Officer, Rural Development Division, Wellington.*

THE selection of a nursery site on the farm in which to grow tree stocks to be used as shelter, and the collection and sowing of seed, were described in the first half of this article, which appeared last month. This section deals with the care and treatment of the tree seedlings, beginning with their wrenching, until they are ready to be planted out.

MOST tree species tend to form a long, strong taproot and if a tree is left undisturbed, the main growth goes into this root and few fibrous roots are formed. The most important factor in growing trees for planting out is the formation of a good fibrous root system, and if the taproot is shortened, the growth of fibrous roots is encouraged. That is the principle of wrenching trees, an operation which usually is carried out first during the autumn and winter after the seed was sown. The same result is obtained by transplanting tree seedlings from boxes into nursery lines, as in lining out, or by transferring them from boxes to pots when especially well-grown specimen trees are required, as for drives.

The Wrenching Process

Wrenching is carried out thus: The length of the taproot is first ascertained by lifting one or two plants and the aim is to make a cut severing the root about one-third of the length from the tip. A sharp spade inserted 5 or 6in. from the side of the tree at an angle of 45 degrees cuts the taproot and long side roots, and the plant is then slightly levered up in the soil. The spade is withdrawn and used in the same way on the next tree, and the loosened plants firmed slightly with the foot. At a second wrenching six or seven weeks later, when the tree has grown sufficient fibrous roots on the side treated first, the opposite side of the line or plant is treated. Wrenching should be carried out only in damp weather to prevent roots drying out when the soil is disturbed.

This operation stimulates the formation of many fibrous roots, which are the main channel of food absorption and which enable the plant to maintain vigorous growth, recover more easily from the shock of moving, and settle down quickly after being transplanted into the farm belt.

Pinus radiata grow rapidly in their first year and for ordinary farm planting are best used as seedlings. These must be wrenched at least twice in their first year to form good roots, and the wrenching also checks the length of soft top growth, so forming a more balanced, sturdier plant.

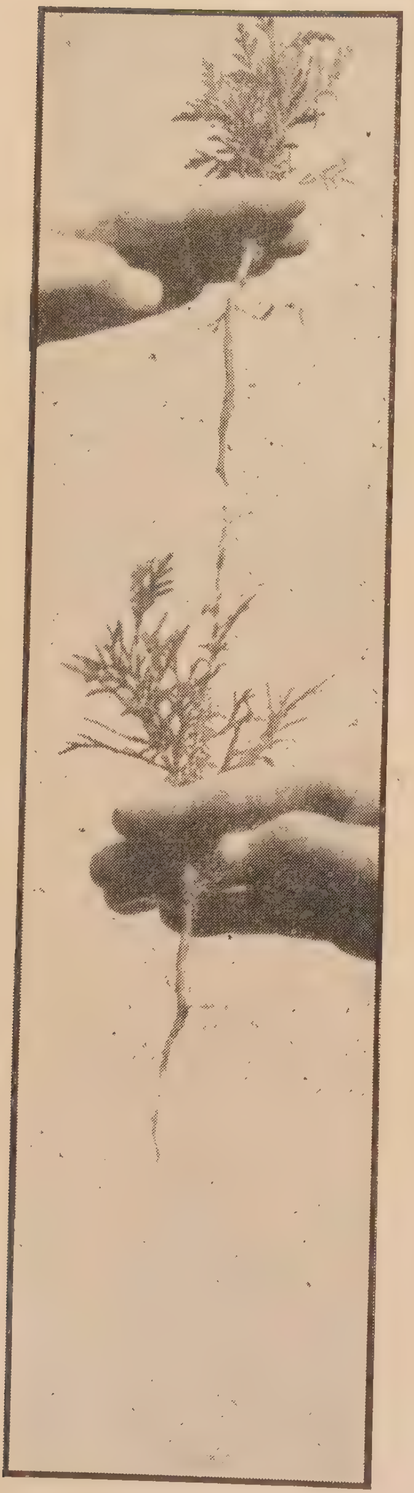
Lining Out

Tree or shrub seedlings grown in boxes or seed-beds require more room for growth after the first six months, and that is obtained by lifting and replanting them in nursery lines where they can be cultivated and may remain until ready to be planted in plantations.

Lining out should be done any time after growth ceases in the autumn and before plants shoot again in spring. It should not be done during very dry, windy weather, as there is danger of the plants getting dried during transplanting. The area to be used should be a clean and cultivated part of the garden or orchard, as free as possible from stones and well drained, so that the soil can be worked in a friable condition. Boxes of plants to be lined out should be taken into a sheltered place or shed, the seedlings carefully removed and sorted into large and small sizes in bundles of about 25 plants, and long, straggling taproots trimmed off cleanly with sharp shears, removing about one-third of the length of the root.

The roots are then dipped into a "puddle" solution which when dried forms a coating on the fine roots and protects them from becoming dried out

LINING OUT SHELTER TREE SEEDLINGS



Two-year-old *Thuja plicata* seedlings which were wrenched once, shortening the taproot. The lower one was faultily wrenched, the spade missing the long side root.

Bundles of two-year-old *Pinus radiata* being heeled in for storage in trenches after having their roots dipped in the puddle solution in the tank in the background.

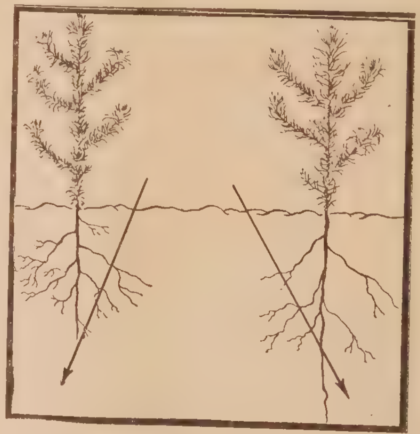
during the lining out. This solution is made by placing into a shallow tub or tin a mixture of about one-quarter clay with dark, peaty loam and making this into a thick, soupy liquid with water. Formerly cow manure was often mixed in the puddle solution, but there are indications that some species do not flourish under this treatment. A thick solution of pumice-soil chocolate mud is excellent for the purpose.

After being dipped the bundles should be replaced in deep boxes or tins until planted, or may be heeled in nearby. Heeling in consists of placing the bundles of trees thinly along the sloping back of a shallow trench, covering the roots with soil, and tramping it lightly; another trench is opened about 9in. in front of the first and trees laid in so that the tops overlap the covered roots of the first row, and so on until the plants are disposed of. They can be kept thus safely until required for lining out.

A strip of the lining area is then raked smooth and along a set line a straight-backed trench is cut 8 or 9in. deep. Seedlings are set against this face with their roots hanging straight down and from 3 to 6in. apart according to the species. To hold the seedlings in place the roots are clamped against the edge with a small handful of damp soil, and when the row is filled up the soil is thrown back into the trench and the plants firmed lightly with the feet as the planter progresses along the line. The level of soil is then made up again by turning in two spade widths from the unplanted ground, the surface smoothed, and the line reset at a distance of 12 or 15in. to allow of cultivation between the lines.

In sandy or pumice soil which falls easily when a straight-backed trench is cut, and if small plants are being transplanted, it is easier to plant the trees directly by inserting a trowel upright in the soil about ½in. on the outside of the line, drawing it forward, and inserting the tree between the trowel and the soil face, taking care that the roots hang down freely, then withdrawing the blade and pressing the soil back against the roots.

Transplant lines should be weeded and the soil surface kept open by periodic hand cultivation or by use of a mechanical cultivator. The lines should be wrenched as soon as growth ceases in the autumn, and again from the

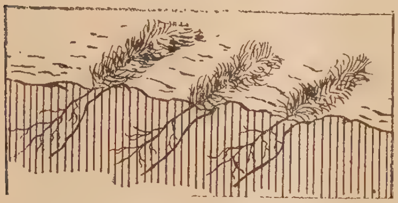


The first and second spade cuts in the wrenching of a tree. In the second diagram the roots of the right side, trimmed some weeks before the second cut was made, are shown to have developed good roots.

opposite side of the line a month or six weeks before the trees are to be lifted for planting out. Trees still too small to be used may be lifted and lined out again for another season.

Size and Age for Planting

The best size of tree to plant varies with the species, the type of country to be planted, and the prevailing conditions, and therefore a definite rule cannot be laid down. The size of plant obtained for a precise age also differs according to the nursery soil and conditions where the stock is raised. On the whole, the use of smaller rather than larger plants should be the aim, as they adjust more easily and quickly to new conditions, but certain circumstances make it wiser to use large plants—for example, to compete with weeds, blackberry, or gorse, or for planting in blowing or shifting sand.



Plants being heeled in are placed in the trenches so that the green tops of one row protect the roots of the previous row from frost or from being dried out by the sun.

The age of plants is shown by a number for each year spent in a seed-bed or in nursery lines. Trees which are left in a seed-bed for one year without being lined out are denoted 1 + 0; if they are lined out after one year they are called 1 + 1; if left for two years in a seed-bed and then lined out they are known as 2 + 1 plants.

Following are the usual types of plants found best for farm planting under normal conditions:

Pinus radiata

1. *Pinus radiata* may be planted best in clean ground as one-year seedlings which have been wrenched at least twice, 6 to 12in. high from ground level to the tip of the stem.

2. If sown in lines or bands, those not big enough to plant out in the winter of their first year should be left in lines and wrenched about four times between late autumn and planting time to check top growth and cause them to make plenty of fibrous roots. They will be about 18in. high by the time they are lifted.

3. Big trees for special purposes such as killing out gorse must have a well-grown and fibrous root system, so it is better to line out seedlings and use transplants (1 + 1) 18 to 23in. high, wrenching the trees about a month before they are required for planting.

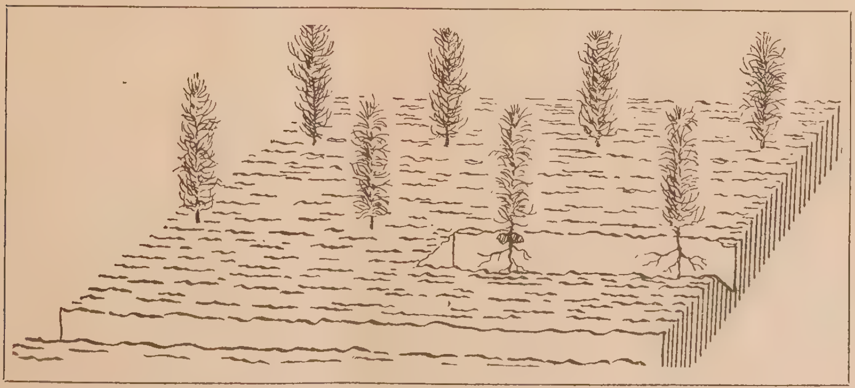
Cupressus macrocarpa

1. This species is most reliable if seed is sown in boxes and the seedlings pricked out when two or three months old into deeper trays, with 2 to 3in. between plants, or into separate pots if a few trees are required for special planting. Trees can be planted out as large, one-year seedlings, 8 to 12in. high.

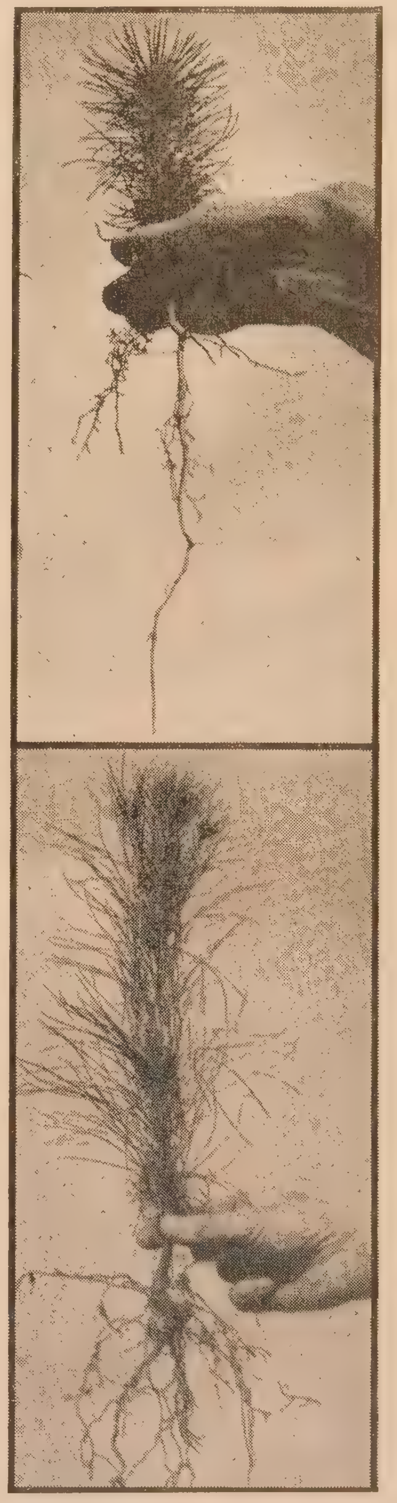
2. Macrocarpa seed may be sown directly into lines in the nursery where the soil is a fairly open loam or sand and frosts are not severe. The largest plants can be used as one-year line-sown trees, from 10in. high, but the majority usually require to be lined out at nine months for one year and used as 1 + 1 when 12 to 15in. high. When grown in lines macrocarpa require wrenching at least twice, in the first and in the second years. Any work should be done in damp weather, as the trees are likely to dry out if lining out or wrenching is succeeded by hot, dry weather.

Oregon pine

1. Most seedlings require to be kept in beds for two years, wrenched twice in each year, and planted out as two-year seedlings (2 + 0) from 10 to 12in. high.



The four stages of lining out trees in a straight-backed trench.



Upper—A seven-month-old seedling, not yet wrenched, with a long straggling main root. Lower—A 1 + 1 transplant of *Pinus radiata* recently wrenched preparatory to being planted out in the woodlot.

Some shelter species can be grown from cuttings, as was this seven-year-old hedge of *Cupressus sempervirens* in Taranaki.

2. Where seedlings grow slowly, planting stock may be two-year seedlings 5 to 8in. high lined out for one year and planted as 2 + 1 trees when about 15in. high.

Lawson's cypress

These seedlings are best sown in boxes in October-November and lined out as nine-months seedlings when 3 to 5in. tall. According to the size required, they should be planted after a year in lines, or taken up and lined out again for another one (1 + 1 + 1) or two (1 + 1 + 2) years. The best size of Lawson's cypress for planting in clean ground is 12in. and such two-year transplants are usually a convenient size to plant.

Cryptomeria japonica, *C. elegans*, and redwood are treated like Lawson's cypress, but all these species can be successfully sown in an open seed-bed, instead of in boxes, provided the beds are shaded from sunshine.

Cedrus deodara

Seedlings of this species grow slowly and may have to be kept for two years in the beds. The deodar requires to be lined out to make a satisfactory root system and is best planted after two years in the nursery lines when 10 to 12in. high.

Plants of broad-leaved trees and many native species take slightly longer than the conifers to grow into planting stock. In such cases it is usual to leave them in beds for two years and then line them out, or, if they are grown in boxes, to prick them out at six to nine months into deeper boxes or straight into nursery lines, where they remain for two seasons, receiving periodic wrenchings and being planted as three- or four-year-old trees.

Planting Stock from Cuttings

Most trees are raised from seed more easily, but there are species which produce seed very sparsely or of which seed is usually infertile, and such plants can often be propagated by vegetative cuttings. Most hedge plants are best produced by cuttings, and these species will be discussed in a later article dealing with hedges. For the farmer the practical points of reproduction by cuttings are that he can obtain planting stock from a special tree without waiting for it to seed, and that cuttings from any sample tree in all probability will grow into trees of the same type. That is important in the selection of suitable good types of Lawson's cypress and other cypress species, all of which are easily propagated by cuttings. As a rule *Pinus* species are most easily grown from seed, but *P. radiata* has been propagated from cuttings, which enables the farmer to reproduce with reasonable certainty the type of pine tree most suited for his requirements.

The main points of taking tree and shrub cuttings are:

Cuttings of woody plants should be taken from young wood of about two seasons' growth, not less than ¼in. in diameter, but not from the soft, fleshy, new growth. *P. radiata* has been grown from slips made by pulling off branches of the top whorl of two-year nursery seedlings or the tips of branches of young trees and planting them in damp, firm sandy nursery soil in June. Cuttings from any of the cypress species should be about 2in. long and taken from the tips of branches. All conifer cuttings should have a heel of the old wood left on.

Some native species reproduce easily from cuttings. For example, twigs of broadleaf (*Griselina littoralis*) about 8in. long and carrying about half a dozen leaves can be used, about half the leaves being stripped off before planting and the stem embedded for a little more than half its length. Willows and poplars will strike at almost any time of the year, but all cuttings are best planted in late summer, when the plant is becoming dormant and the sap going down; that reduces evaporation from leaves and keeps the cuttings moister.

The main principle of growing from cuttings is to make the stem produce a callus covering to the cut surface, from the edge of which roots are produced.

Cuttings can be grown in boxes or in the open with 2 or 3in. between them and should be kept in a sheltered position. The necessary conditions for raising cuttings are:

They should be taken in summer preferably, and from young wood.

They should be planted in a sandy or well-drained, light soil and kept moist and sheltered from sunshine.

There should be as little delay as possible between taking the cutting and planting it, so that the cut surface has no chance to dry out.

When roots have begun to form it is an advantage to keep the soil well cultivated between the lines.

Further information on the subject has been given in previous articles in the "Journal of Agriculture—"Farm Shelter," by T. E. Rodda, May, 1946, page 501; "Growing Plants in Pots and Boxes," by J. P. Hudson, July, 1947, page 89, and August, 1947, page 199.

Rotorua District Field-crop Competitions

By C. R. TAYLOR, *Fields Instructor, Rotorua.*

REALISING the tremendous value of crop competitions in promoting the development of any young rural area, three local branches of Federated Farmers in the Rotorua district (Rotorua-Ngongotaha, Ngakuru, and Reporoa) in October, 1946, formed a strong central committee empowered to decide on types of competitions considered most advantageous to the districts. In addition to the central committee, which is really the governing body of the competitions, each local branch of Federated Farmers taking part has its own competitions' committee. Members compete only within their own branch competitions. All are, however, bound by the same rules and general conditions. The 1946-47 season commenced with competitions for swedes, hay (stacked), hay (baled), hay (lucerne), and silage.

The 68 entries received were made up as follows: Swedes 28, hay (stacked) 22, hay (baled) 13, hay (lucerne) 3, and silage 2. Only three entries—one from each of three districts—were received for lucerne hay and only two from different districts for silage. In these sections it was necessary to waive the rule that members of one branch should not compete with those of others. The writer was the judge for the competitions.

Considering the serious effect which bad weather conditions in the spring and summer had on the development of crops, together with a natural timidity on the part of many farmers to enter their crops for the first time, the number finally judged can be regarded as highly satisfactory for relatively-small districts and augured well for the future of such competitions.

Placed entrants in each competition were awarded a Certificate of Merit issued by the Department of Agriculture.

The Ngakuru branch of Federated Farmers won the Rotorua Agricultural and Pastoral Association's challenge shield for swedes, Rotorua-Ngongotaha were second, and Reporoa third. The association's challenge shield for hay was won by the Rotorua-Ngongotaha branch, Ngakuru were second, and Reporoa third.

RESULTS

Results of the competitions in each of the areas were as follows:—

Swedes

ROTORUA-NGONGOTAHA

Sir Ernest Davis (general points 47, points for yield 47½) 94½ points, 1.
(High-yielding crop, but some mottled heart disease.)

E. A. Missen (general points 45, points for yield 45½) 90½ points, 2.
(High-yielding crop, but some mottled heart disease.)

W. Branson (general points 44, points for yield 41½) 85½ points, 3.
(Fairly high-yielding crop, but some disease present.)

Thirteen entries were received, the highest yield being 47½ tons, the lowest 29 tons.

NGAKURU

J. B. Robertson (general points 50, points for yield 65) 115 points, 1.
(High-yielding crop, free from disease.)

E. Morey (general points 43, points for yield 65) 108 points, 2.
(High-yielding crop spoilt by mottled heart disease.)

A. M. Frost (general points 49, points for yield 50) 99 points, 3.
(High-yielding crop, almost free from disease.)

Of the ten entries the highest-yielding crop, which was sown in 21in. rows and inter-row-cultivated once, produced 65 tons, and the lowest 33 tons.

REPOROA

E. Ferguson (general points 44, points for yield 57) 101 points, 1.
(High-yielding crop with little disease.)

L. M. Duley (general points 43, points for yield 42) 85 points, 2.
(Fairly high-yielding crop, some disease, sowing faulty.)

R. A. Williamson (general points 41, points for yield 42) 83 points, 3.
(Fairly high-yielding crop, but too much disease.)

Only five entries were received, the highest yielding 57 tons and the lowest 20 tons.

The possible general points were 60 and were made up as follows: 25 for treatment of land before sowing, 10 for care given to sowing and manuring, 10 for freedom from disease, 5 for trueness to type, 10 for records kept and supplied to the judge. Points for yield were awarded by allowing one point for every ton of yield.

Hay (Stacked)

ROTORUA—NGONGOTAHA

K. H. Martin, 93 points, 1. (Excellent clover-grass balance, well saved.)

F. J. Coulter and K. M. Martin, 87 points, 2 equal. (Rather weak in clover, otherwise excellent).

E. F. Witthause, 86 points, 4. (Rather weak in clover, otherwise excellent.)

NGAKURU

J. B. Robertson, 85 points, 1. (Nice clover mixture, well saved.)

J. B. Robertson (second entry), 82 points, 2. (Good clover hay, perhaps a little coarse.)

N. Swindlehurst, 81 points, 3. (Good clover-oaten hay, just a little brittle.)

REPOROA

A. M. Paton, 82 points, 1. (Well saved, but very weak in clover.)

F. W. Ross, 80 points, 2. (Rather brittle and clover deficient.)

L. M. Duley, 79 points, 3. (Rather brittle and clover deficient.)

Hay (Baled)

ROTORUA-NGONGOTAHA

A. J. M. Brown, 83 points, 1. (Rather weak in clover, otherwise good.)

Gee and Sons Ltd., 82 points, 2. (Rather weak in clover, otherwise good.)

Sir Ernest Davis, 81 points, 3. (Weak in clover and rather brittle.)

NGAKURU

I. J. Brosnahan, 89 points, 1. (Well saved, with fairly good clover.)

K. Lyons-Montgomery, 83 points, 2. (Not very strong in clover, otherwise good.)

REPOROA

H. G. Morris, 87 points, 1. (Well saved, with good clover content).

E. Ferguson, 86 points, 2. (Well saved, with good clover content.)

H. Alexander, 82 points, 3. (More clover desirable.)

Points were awarded as follows: Quality 40, condition 25, protection from weather and stock 20, choice of site 5, records kept 10; total 100.

The winning stack of meadow hay in the Rotorua-Ngongotaha district. Note the sound construction of the protective fence.

Silage

K. Lyons-Montgomery (Ngakuru), 84 points (possible 100), 1. (Excellent silage, but there was some unnecessary waste on sides and bottom.)

M. C. Wiggins (Rotorua-Ngongotaha), 71 points, 2. (Overheating and waste had resulted from material being too matured and coarse, and insufficiently weighted, especially at edge, to control temperature.)

Lucerne Hay

E. Morey (Ngakuru), 91 points (possible 100), 1. (Baled lucerne of a very high standard.)

R. J. Wilkinson (Reporoa), 87 points, 2. (Stacked, a little coarse, otherwise good.)

Sir Ernest Davis (Rotorua-Ngongotaha), 84 points, 3. (Baled, good-quality lucerne spoiled by slight mustiness.)

GENERAL COMMENTS

Swedes

Though no safe conclusions can be arrived at as the result of only one year's competitions, the following points are interesting:—

Seed: The first-placed crop in each of the three districts, together with two of the second-placed crops and one third-placed, were produced from Crimson King. Two third places were won with Superlative. Other varieties grown were Grandmaster, New Zealand Resistant, and New Zealand Sensation, but these did not win a place.

The quantity of seed sown per acre varied between 10oz. and 1¾lb. Except for three placed entries, which were sown at the rate of 10oz. (two entries) and 14oz. respectively, the crops were sown at the rate of 1lb. to the acre, but even at this rate many were too thick.

Ten competitors mixed seed and manure and drilled through every second coulter, one drilled through every third coulter (21in. rows), and 17 broadcast seed, using the ordinary manure topdresser.

Two of the first-placed entries were drilled (one in 14in. rows and the other in 21in. rows), and the third was broadcast. Two of the second-placed entries were drilled, the other being broadcast. All three of the third-placed entries were broadcast.

Though there appeared to be little difference between drilling in 14in. rows and broadcasting, there was a considerable difference between crops produced under both these methods and the one crop sown in 21in. rows and inter-row-cultivated once. In the latter weeds were fewer, bulbs much larger and more vigorous, necks less coarse than in many other instances, and the yield high (65 tons). Where practicable, and especially where weeds are troublesome, this method is worthy of trial.

Eleven entries were sown from early to late November, including five of the nine placed crops. Sixteen were sown between early December and Christmas, including four placed entries, and one was sown between Christmas and New Year. Generally those sown between mid- and late November appeared to be among the best.

The relationship between the time of ploughing and time of sowing is interesting, especially for farmers on the lighter type of pumice soil. As five of the nine placed crops were sown from mid- to late November, it is evident that there was little time between ploughing and sowing. Even with the last sown crop of those placed the ploughing was started just one month before, on November 11.

Cultivation: In the initial cultivation 25 competitors used the plough to prepare their land and three used giant discs or bush and bog types. The depth of ploughing varied from 4in. to 7in. All competitors whose entries won a place ploughed the land, the average depth being 5in. For one first-placed crop the land was ploughed to a depth of 7in. The crop of one competitor who "bush and bogged" his land showed definite promise, but the rest were not good. All were ploughed or disced out of grass.

Except for two placed entries where ploughing was commenced in late July and early September respectively, all placed competitors ploughed between early and late November. The two early ploughings took place on swamp and semi-swamp land at Reporoa.

Other cultivation work appeared to conform with the general practice of two or three cuts with discs, followed by a stroke or two with tripod and chain harrows. In odd cases competitors used tine harrows as well.

Only ten competitors rolled their land at any stage before sowing. Of the total placed entries four used the roller to consolidate the seed-bed and five did not.

Disease: Far too many promising crops were spoilt through mottled heart disease—a condition caused by a deficiency of boron, and quite easily controlled by applying 8 to 10lb. of borax to the acre. Very few competitors used any borax because of its scarcity, and this would undoubtedly account for the high incidence of mottled heart disease. This was particularly noticeable in the Rotorua-Ngongotaha area, where the majority of competitors lost heavily in points allocated for freedom from disease.

Records kept: Most competitors scored well in the section for records kept. The competition will achieve its full purpose if competitors note at the appropriate time the chief facts about the growing of swedes or the saving of the hay or silage entered.

Hay (Stacked and Baled)

For the most part the quality of hay entered was not high. This was caused largely by weakness in clover content, though in certain cases it was evident that too little care in covering had spoilt otherwise good hay. In a few instances the quality of the cut material was so low that no matter how well saved, it was impossible to produce an article having any real food value.

Judging by the prevalence of goose-grass, browntop, sweet vernal, and similarly-inferior grasses in these entries, together with an almost total absence of clovers and better grass species, it would appear that the fields had run out either from lack of sufficient topdressing or through being cut too often in successive years for hay.

In general it was found that very few competitors trouble to place their stacks on foundations to permit circulation of air under the freshly-cut and partially-cured material.

No substantial difference in the standard of general quality was detected between well-stacked and properly-baled hay where reasonable protective precautions had been taken. Where baling had been done poorly (and there was some evidence of this) and the bales stacked out in the open, losses were more serious than those resulting from equally bad stacking.

Closing of fields: Eight competitors closed their fields in September, 17 in October, nine in November, and one in December. The three lucerne hay entries are excluded from this summary, as lucerne is a specialised crop requiring different management. There appeared to be no correlation between the time of closing fields and general quality of the final product.

Harvesting: Harvesting was commenced by one competitor on November 30, six in December, 26 in January, and two in February. With the exception of three placed crops, all, including stacked and baled hay, were harvested in January. Two placed crops were harvested in late November and early December respectively and the third was harvested early in February.

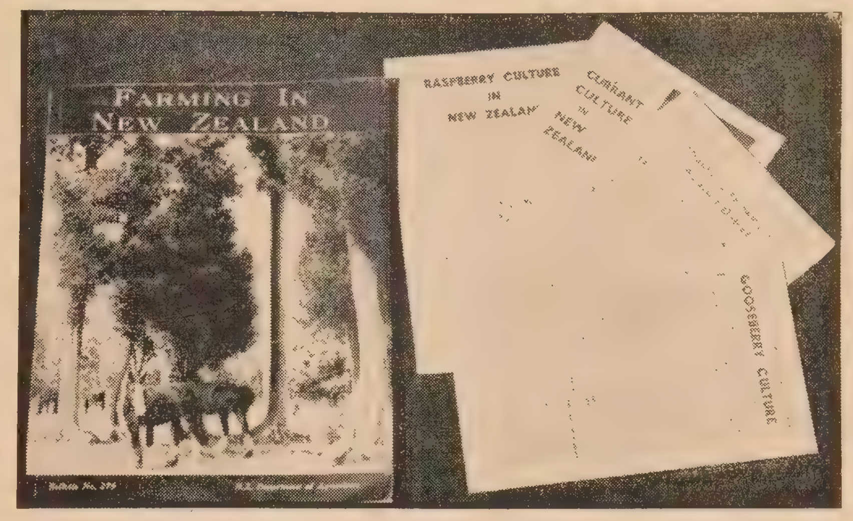
Generally entries which were harvested before January were superior in grass content and quality, but lacked seriously essential clovers.

Silage

Very little silage is normally made in the Rotorua district, but many more entries may be received in future competitions because of the recent increase in lucerne stands. This applies also to lucerne hay entries.

Helpful Books for the Small Fruit Grower

SMALL fruits are in very keen demand and short supply and attractive prospects are open to growers who can produce heavy, regular crops of these fruits. Prospective growers and those who already grow small fruits will find it profitable to study the literature described in this article by J. P. Hudson, Horticulturist, Wellington.


FARMING IN NEW ZEALAND
RASPBERRY CULTURE IN NEW ZEALAND
CURRANT CULTURE IN NEW ZEALAND
GOOSEBERRY CULTURE

[*Photo News Ltd. photo.*

IT is many years since small fruits were in such short supply as they are at present, and all of them, especially raspberries and strawberries, are keenly sought by buyers. The housewife likes to use each fruit in its season for eating raw or in puddings and pies, and is especially keen to make jam of raspberries or strawberries because the bright red colour of these jams makes them so useful in cake- and pastry-making. For the same reason raspberry jam is a favourite with the confectionery trade, and jam factories and canneries would willingly take several hundreds of tons more small fruits than are at present available in the Dominion.

Most families who do not grow their own fruit would be glad to buy at least one bucket of raspberries a year for jam-making, but the total annual commercial production of raspberries in New Zealand now amounts to only about a pound of fruit per head of population, and the commercial crops of other small fruits—strawberries, gooseberries, and currants—put together amount to only about another pound per head a year.

Early settlers seem to have found that small fruits could be grown with the greatest of ease. Once planted, they grew vigorously and bore prolific crops, no special attention being paid to manuring or cultivation and none at all to spraying for the control of diseases or pests. However, those happy days seem to have gone, and although some growers are still producing heavy, regular crops of small fruits, it is only by selecting the land with care and paying great attention to the details of cultivation, manuring, and disease and pest control.

Choice of Site and Soil

Of the various factors governing the production of heavy, regular crops of small fruits the choice of site and soil is by far the most important. The behaviour of the soil is a factor which cannot be controlled by the grower, who can modify it to some extent by suitable cultural practices, but cannot easily change a bad soil into a good one or an unsuitable soil into one in which small fruits will thrive, and there are few crops grown commercially on farm or garden that are as sensitive to varying soil conditions as small fruits, especially raspberries.

As soils are so important, and have such a direct bearing on the cropping capacity and profitability of small fruits, a study of the nature and characteristics of soils will well repay anyone interested in these crops. This study will enable the established grower to get the very best results from the soil which he already has, and the prospective grower will be better able after study of the question to choose a section really suitable for commercial small fruit growing, where unfavourable soil conditions will not be weighting the scales against profitable production and giving the grower an extra and unnecessary handicap.

Certain districts have come to be regarded as suitable for small fruit growing, because one or other of these crops has been grown successfully there for many years. In each district cultural practices have been established as a result of a long process of trial and error and an intimate knowledge of the locality. However, it does not follow that a new grower will always succeed in the same district, even if he faithfully follows local practice, as there may be areas of extremely unsuitable soil types within a few chains of the gardens of established and successful growers, and a garden on these poor soil types would offer little hope of success.

On the other hand, there might be excellent prospects on a section of ideal soil type in a district where small fruits have not been grown before on a commercial scale, although it requires considerable courage to be a pioneer grower of a crop in a new district in this way, and it should be undertaken only after a very careful consideration of all the factors involved. There is thus a very good reason why small fruit growers should study the soil seriously.

Good Books About Soils

Few sciences have made such rapid strides in the last ten years as the science of the study of the soil, now commonly referred to as pedology. A generation ago the soil was regarded as something to be weighed, measured, and analysed, an approach that appealed more to the chemist and physicist than to the practical farmer.

The whole scientific conception of the soil has changed during the last few years and it is now approached and studied more as a live and changing material with which the crop plants are living in a very close partnership. This approach appeals more to the grower, who finds that modern soil science can help him directly in his day-to-day cultural problems, and a proper understanding of soil characteristics can be of the greatest help to anyone who is looking for a piece of land suitable for growing some special crop.

A book recently published in England explains this new approach to soil science very clearly. "Good Soil," by S. G. Brade-Birks, first published in 1944 by the English Universities Press Ltd., price about 6s. in New Zealand, is one of the best books of its type now to be had. It will prove of absorbing interest to small fruit growers, and, indeed, to anyone concerned with primary production, where all wealth stems from the soil. For information on soil types and characteristics the book will be equally helpful to the

BOOKS FOR THE SMALL FRUIT GROWER . . .

grower who is wondering what crop his soil will grow best or the trainee who has decided on his main crop and is looking for suitable land on which to grow it. It also indicates the general principles by which soils can be improved within certain limits by drainage, liming, or application of manures and fertilisers, but gives warning to the over-optimistic not to expect too much from these practices if the soil type is totally unsuitable in the first place.

"Good Soil" was, of course, written primarily for the English reader and loses something of its value to the New Zealand grower because he will not be familiar with the local soils and conditions often mentioned as examples in the book. However, the basic principles apply equally well to Dominion soils, which have been described in articles by L. I. Grange in the "Journal." These articles were recently reprinted in Bulletin No. 279, "Farming in New Zealand," which is obtainable from any office of the Department of Agriculture, price 2s. 6d. Grange's interesting and well-illustrated articles will help to provide the local background if read in conjunction with "Good Soil."

Useful New Bulletins

Although the relationship between soil and plant is such an important factor in growing small fruits successfully, other aspects of the culture of these crops must not be overlooked. It is not only soil problems that have brought the small fruit industry to its present low ebb.

Certain officers of the Horticulture Division have been paying special attention to the problems of small fruit growing in the last two or three years and the results of their observations and studies have been published in the "Journal" from time to time. Investigations are still continuing. The full story about the raspberry problem, for example, is still not unfolded, and certain difficulties in the strawberry industry have still to be overcome, but it was decided that all the available information on small fruit growing should be assembled and published for the benefit of present and prospective growers. As a start, a comprehensive article on "Loganberry Culture," by J. Coombe, was published in the April, 1947, issue of the "Journal."

The following four bulletins have now been published and can be obtained free of charge from any office of the Department of Agriculture:—

"Raspberry Culture in New Zealand," Bulletin No. 258 (revised), by J. H. Watt.

"Currant Culture in New Zealand," Bulletin No. 282, by J. H. Watt.

"Strawberry Growing in Auckland District," Bulletin No. 293, by F. L. Bailey.

"Gooseberry Culture," Bulletin No. 297, by J. H. Watt.

Each bulletin is clearly written and freely illustrated and each gives what is probably the most comprehensive account of its subject that has so far appeared in New Zealand. The publication of these bulletins and articles marks an important step in providing up-to-date advice to commercial growers of small fruits, who cannot afford to be without them. Home gardeners will also find them full of interest.

Pear Tree a Century and a Quarter Old

[*F. Dickeson photo.*

Though he visited the country only at infrequent intervals, the Rev. Samuel Marsden, a clergyman of the Church Missionary Society, was the pioneer of European farming in New Zealand. Still flourishing at Kerikeri as a reminder of his foresight is this Jargonelle pear tree, one of the three oldest trees in the Dominion, which he planted about 1820. No mere talker and writer on farming, Marsden was the driving force behind the agricultural activities of the settlers and was himself a prominent farmer at Parramatta, New South Wales. The first stations of the Missionary Society were centred at the Bay of Islands—at Rangihoua, Kerikeri, and Paihia. Farming operations were confined mainly to gardening and a small area of wheat. Kerikeri was intended to be the main farming centre, but the land was not suitable and in 1829 the missionaries decided to transfer farming activities to Waimate, nine miles inland.

SHEEP AND WOOL INSTRUCTORS

Five specialist officers as Sheep and Wool Instructors located at Hastings, Wanganui, Christchurch, Timaru, and Invercargill have been appointed by the Department of Agriculture, and it is hoped to appoint another at Auckland. These officers are primarily concerned with instructional work among sheep farmers on the production, growth, and marketing of sheep and wool, and their sphere does not overlap that of the Veterinarians, Inspectors of Stock, or Fields Instructors. Their work will include personal visits to farms, lectures and demonstrations to groups such as branches of Federated Farmers or Young Farmers' Clubs, and advice by letter. Information will be available on the preparation of wool clips for market, wool faults and their remedies, selection of sheep for wool, plans for woolsheds, yards, and dips, and on the latest findings and applications of research work to wool production. It is also hoped that with the co-operation of farmers a survey will be carried out to define in their order of importance the problems of wool production.

Intensive Grassland Farming

By P. W. SMALLFIELD, *Director, Rural Development Division.*

THE first section of this article, which appeared in the December issue of the "Journal," dealt with the development of intensive grassland farming practices on ploughable land and the problems of reversion, deterioration, and erosion on hill-country grazing lands between 1920 and 1945. This section continues the discussion of farming progress during the period and describes the developments which took place in annual crop production and in the meat industry. The final section will appear in the June issue.

[*National Publicity Studios photo.*

TOPDRESSING and the use of perennial strains of grasses and clovers in the high-rainfall districts lessened the need both for ploughing up grassland for renewal and for the provision of grass supplementary feeding crops. For with the development of perennial ryegrass-white clover pastures, winter, spring, and autumn pasture production was raised and hay and silage cut from permanent pastures became increasingly relied on for supplementary feeding. Accordingly fodder crop production fell in the North Island, as did cereal production in the South Island, as tractors and motor transport replaced horses.

Table XIII gives the mean annual acreage of land devoted to cereal and pulse crops and root and green feeding crops for five-yearly periods between 1921 and 1945.

TABLE XIII—ANNUAL CROP PRODUCTION 1921-45

Period	Mean annual area Cereal and pulse (acres)	Root and green crops (acres)
1921-25	802,189	755,255
1926-30	608,101	729,814
1931-35	672,154	708,950
1936-40	592,405	662,099
1941-45	604,551	672,736

The decline of about 200,000 acres in the area devoted to cereals was caused by the curtailment of the area under oats; oats for threshing declined by 100,000 acres and oats for chaff by more than 200,000 acres between 1920 and 1945. Though the decline in the area under root and green crops was less than 100,000 acres, the changes in feeding practices, especially in the North Island, were more marked than is indicated by this reduction, for in this period cows in milk increased by a million and breeding ewes by nine million. To provide for the additional million cows the area cut for hay and silage rose from 117,000 acres in 1920 to 574,000 acres in 1944, but the nine million more breeding ewes required practically no additional feeding crops because of the improved productivity of the pastures in the intensive grassland farming districts.

Mechanisation

The period was marked by the adoption of the tractor for cultivation and harvesting and the passing of the four- and six-horse teams in the arable farming districts. Toward the end of the period thousands of North Island dairy farmers changed from horses to rubber-tyred tractors for hay and silage making, general cultivation, and carting. The number of tractors in use rose from 324 in 1920 to 18,940 in 1946.

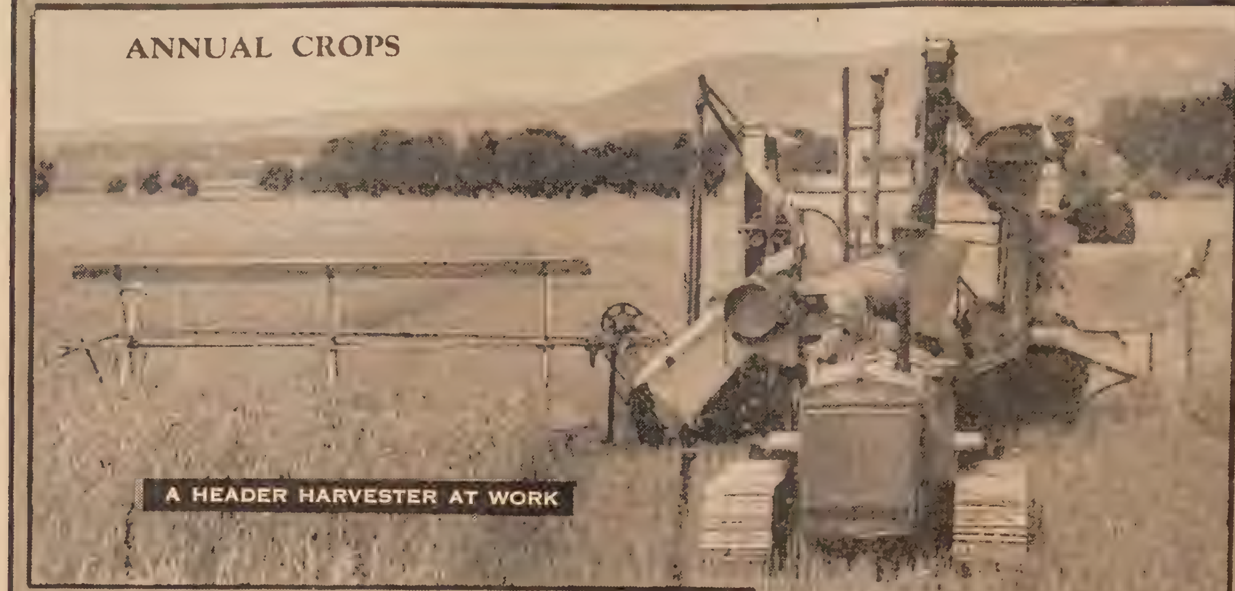
TABLE XIV—FARM TRACTORS

Year	North Island	South Island	Total
1920	186	138	324
1925	399	627	1,026
1930	1,197	2,694	3,891
1935	1,956	3,393	5,349
1940	5,256	6,022	11,278
1946	9,203	9,737	18,940

The recent rapid rise in the use of the tractor has been very largely the result of the increased efficiency of the tractor and its equipment. As long as tractors were designed merely to pull implements intended to be drawn by horses they made only slow progress, but with the advent of crawlers and rubber-tyred wheel tractors, power take-off facilities, and specially-designed tractor implements, the tractor rapidly replaced the horse.

Though it may appear that the adoption of the tractor has made little difference in farm management methods on sheep, dairy, or mixed farms and has not resulted in an increase either in supplementary feed provision on dairy farms or in cash cropping on mixed farms, it is almost certain that without the tractor and tractor implements wheat and fodder crop production would have

ANNUAL CROPS



A HEADER HARVESTER AT WORK

The area under fodder crops and cereals fell during the 1920-45 period by about a quarter of a million acres, the main reduction being in the oat crop. Header harvesters were first used in the harvest of 1930, and in 1945 about four-fifths of the wheat crops were headed (including windrowing). The use of the header has also extended to barley and oat crops.

CHOU MOELLIER

While the total area in root and green crops fell from an average of 755,000 acres in the 1921-25 period to 673,000 acres in the 1941-45 period, there were also important changes in the areas devoted to each crop. Swede and turnip production fell by about 200,000 acres, but part of that loss was made up by a rise in the acreage of chou moellier, which rose from 1000 in 1931 to 78,000 in 1945.

fallen considerably. In fact, wheat production is now based largely on the tractor and the header harvester, and more than four-fifths of the wheat crops are now harvested by this method. The tractor has lightened the burden and increased the efficiency of labour through the elimination of the work of early morning and evening feeding and grooming of horses, and consequently its use is likely to extend, though the cost of the change-over has not been inconsiderable; in 1944 the value of imported tractors and tractor parts was £1,200,000, and that will undoubtedly rise considerably in future years.

Cereal and Pulse Crops

The wheat acreage fluctuated considerably, depending chiefly on the price of lamb. When the prospects for lamb were good, rotation pastures were left down for another year or two and devoted to sheep grazing instead of wheat production; on the other hand, wheat production rose when lamb prices fell. More than 300,000 acres were harvested only in 1922 and 1933, but in the war crisis of 1943, when invasion threatened, the area of wheat harvested rose to slightly more than 280,000 acres.

With a rising population, New Zealand became increasingly dependent on imported wheat, and present consumption for all purposes amounts to 12,500,000 bushels, which would require not fewer than 400,000 acres to produce. Even the wheat acreage fluctuating around 200,000 acres during recent years would not have been maintained but for the introduction of the header harvester. Headers were first used in the harvest of 1930, and in 1945 about four-fifths of the wheat harvested was headed (including windrowing). The use of the header was also extended to other cereals, first to barley and then to oats, and latterly mechanised pickers have been imported for harvesting maize.

Wheat yields showed an improvement during the period because of the general adoption of superphosphate for manuring wheat and grass and the introduction of improved varieties, of which Cross 7 has been the most outstanding for both consistent yield and adaptability for header harvesting. In 1945 Cross 7 was used on 65 per cent. of the wheat area, Fife-Tuscan on 8.5 per cent., and Tuscan on 14 per cent.

Oat production for both chaff and greenfeed declined both because motor transport replaced horses and because advances in intensive grassland farming reduced the need for fodder crops, and the consequent cheaply-produced oat crop in the common rotation of roots, oats, and grass was reduced in area as the fodder crop area fell. The area of oats for threshing dropped from between 150,000 and 175,000 acres in the early part of the period to between 50,000 and 75,000 acres at the end, while oats for chaff fell from between 300,000 and 400,000 acres to between 100,000 and 120,000 acres. Oats for greenfeed, however, rose from fewer than 20,000 acres in the early 1920's to more than 50,000 acres in the 1940's, reflecting the growing importance of fat lamb production on arable farms, on which green oats is frequently used for autumn, winter, and early spring feeding of breeding ewes.

Barley production fluctuated around 25,000 acres during the first 20 years of the period but rose fairly consistently in the 1940's, when it ranged between 25,000 acres in 1940 and 48,000 acres in 1946. Improved production was secured largely through the mutual efforts of farmers, brewers, and the Department of Agriculture in inaugurating a contract system of growing in an endeavour to secure Dominion self-sufficiency in malting barley.

The maize area showed a decline from between 9000 and 11,000 acres in the early 1920's to a level of 6000 to 8000 acres in the 1930's, largely because the development of really permanent pastures in the Bay of Plenty meant the avoidance of cropping during pasture renewal. During the war production was raised to 10,700 acres in 1941 and 8470 acres in 1945.

The declining cereal acreage during the period necessitated the importation of cereals and cereal by-products from Australia, and many of the production difficulties, particularly in the poultry and pig industries, which occurred during the war and immediate post-war years were the result of lack of stock-feeding cereals and cereal by-products.

The arable farming areas of New Zealand have a very favourable climate for dry pea production and the country has long been an exporter of both food and seed peas. Most of the peas are grown on contract and the acreage is defined in advance on anticipated demand. In the 1920's and 1930's the area fluctuated between 10,000 and 20,000 acres but rose during the war and reached more than 44,000 acres in 1944.

Food and Fibre Crops

Apart from potatoes grown within borough limits and in domestic gardens, New Zealand requires annually the production from about 22,500 acres of potatoes on present population numbers, and if population continues to increase at present rates, an additional 500 acres will be required each year. During the 25-year period under review the area under potatoes has fluctuated above and below 20,000 acres, leading to over- and under-supply and consequent export (and in some years waste) and import of potatoes. The lowest acreage recorded was 15,000 in 1942 and the greatest 29,750 in 1945, when a considerable quantity of potatoes was required for the United States forces in the Pacific. There has also been some change in the distribution of crops and the South Island's contribution has fallen from 76 per cent. to 70 per cent. of the total; that is accounted for by the greater increase in North Island population and the production there of early potatoes. To fulfil the Dominion's requirements the North Island should grow about 6000 acres and the South Island about 17,000 acres.

The certification of seed potatoes, aimed primarily at control of virus diseases and varietal purity, has been of considerable assistance in maintaining satisfactory yields during the period, but the necessity for hand work in picking up mechanically-dug potatoes is still one of the problems of production; full mechanisation will have to be perfected if the necessary supply of potatoes is to be maintained at a not-excessive cost. With the large amount of hand labour required in harvesting, the crop compares unfavourably with alternative cash crops where production has been fully mechanised.

The growing of linseed for oil production showed considerable fluctuations. Up to 1924 the area rose fairly consistently from 5000 acres in 1920 to 12,000 acres in 1924, then declined in the more prosperous years for lamb production, but rose again to 12,000 acres in 1931. With the cessation of operations by a local oil-processing plant cultivation of the crop declined, and the area devoted to it then fluctuated between 300 and 3000 acres annually. With the re-establishment of a local oil and cake-processing plant the area again increased, and in 1945 4000 acres and in 1946 more than 10,000 acres were under linseed.

The wartime drive for linen flax production was the chief cause in reviving the linseed industry, for surpluses of seed from the linen flax industry led to the establishment of the oil-extraction plant. Linen flax was first grown on a commercial scale in 1940-41 as the result of an appeal from the United Kingdom Government when eastern Europe was invaded. Linen flax production was a remarkable undertaking: In the first season 13,000 acres were grown and 11 factories established to process the crop. All the machinery was made in New Zealand and the staff had to be collected and instructed in their work. In the following season 20,000 acres were grown and 17 factories operated. In the last two seasons of the war period the acreage fell to about 10,000 as the need for fibre became less urgent.

Photograph at top of opposite page by Green and Hahn Ltd.

DEVELOPMENT OF CROPPING . . .

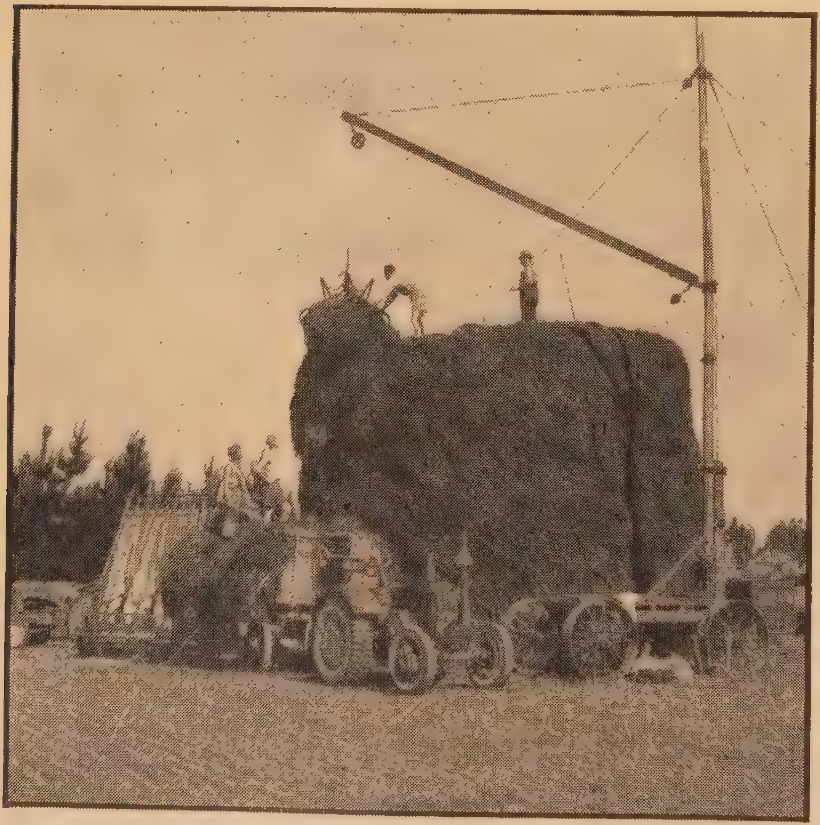
The export of phormium fibre declined rapidly after 1930 because of low prices and the gradual conversion of phormium swamps into farming land. Exports, which in 1920 amounted to 19,000 tons valued at £648,000, had fallen to 18,000 tons valued at £31,000 in 1931. A textile factory for the production of wool packs was then established at Foxton in an effort to stabilise the industry, and since 1939 practically no phormium fibre has been exported. On the entry of Japan into the war supplies of hard fibre (manila and sisal) were practically cut off and attention was given to the full use of phormium for the making of ropes for the Royal New Zealand and United States Navies operating in the Pacific. Production of fibre, which in the early years of the war was about 3500 tons, was raised to 5400 tons in 1943-44 and 5000 tons in 1944-45.

Root and Green Fodder Crops

While the total area in root and green crops fell from an average of 755,000 acres in 1921-25 to 673,000 acres in 1941-45, there were also important changes in the areas devoted to various crops. Swede and turnip production fell by about 200,000 acres, but part of that loss was made good by a rise in the area of chou moellier, which increased from 1000 acres in 1931 to 78,000 acres in 1945. This change from swedes to chou moellier was caused mainly by the development of better grass-farming methods: Less pasture land required renewing and less oats was required, hence two fodder crops were taken in the rotation instead of one; the rotation of grass, swedes, oats, and grass was replaced by one of grass, swedes, chou moellier, and oats. Fodder crops requiring considerable hand labour declined in popularity; for example, mangolds fell from a maximum acreage of 15,000 in 1925 to 4900 acres in 1945.

Grass and Clover Seed

Grass and clover seed production fluctuated considerably during the period, largely because of variation in seed prices. The main pasture seeds are produced to meet local needs and only surpluses are exported, but export prices largely determine local prices and an increased export demand naturally stimulates production. The main change in the period has been the development of seed certification, which was inaugurated by the Department of Agriculture in 1929 to identify superior strains of seeds. Grass and clover seeds at present included under this scheme are perennial and Italian ryegrass, cocksfoot, browntop, cowgrass, and white clover. In the early period of the scheme certification applied to those superior strains of seed which were collected from existing pasture lands—for example, Hawke's Bay ryegrass and Akaroa cocksfoot. Then the Plant Research Bureau produced specially-selected strains on which the certification scheme is now largely based.



[*National Publicity Studios photo.*

The practice of silage making increased rapidly up to 1932-33, when 116,000 acres were harvested, and then declined until in 1943-44 only 53,000 acres were cut. The decline in silage making has been largely the result of the high labour requirement for harvesting the green material and more recently of the development of the pick-up hay baler, which allows of rapid harvesting and consequently lessens weather hazards.

The areas harvested for grass and clover seed production in the 1943-44 season were:—

	Acres
Perennial ryegrass . .	56,276
Italian ryegrass	11,096
Cocksfoot	10,797
Chewings fescue	12,036
Crested dogstail	4.947
Red clover (cowgrass) . .	20,615
White clover	14,985
Browntop	9.263
Other grasses, clovers, and lucerne	1,597

Perennial ryegrass acreage fluctuated from as low as 21,000 in 1927-28 to as high as 69,000 in 1932-33. The main changes in production were the substitution of certified strains of truly perennial ryegrass for the short-lived strains which formed the bulk of the seed produced in the early part of the period and the use of the pick-up harvester in the place of the binder and threshing mill for harvesting.

Italian ryegrass production fluctuated from 2500 acres in 1927-28 to as high as 18.000 acres in 1932-33. Strain of seed and method of harvesting have changed as with perennial ryegrass.

Cocksfoot seed production, which in the early part of the period was mainly harvested by hand from hill-country pastures (for example, Akaroa) moved to the plains, where specially-sown crops could be harvested first with the binder and later with the mower and pick-up harvester. The largest area harvested in the period was 17,500 acres in 1920-21 and the smallest 9400 acres in 1931-32.

Chewings fescue and browntop are produced mainly for export for lawn grass and golf and other greens, only about one-fifth of the seed harvested being used in the Dominion. The areas harvested for chewings fescue and browntop seed each varied from as low as about 5000 acres to as high as 15,000 acres during the period.

HAY AND SILAGE PRODUCTION

[*National Publicity Studios photo.*

The area cut for hay and silage rose from about 162,000 acres in 1920-21 to 574,000 acres in 1943-44, or, roughly, in the 1920-21 season one acre was cut for every five and a half cows in milk and in the 1943-44 season one acre was cut for every three cows in milk. The tractor, with its accompanying mower and sweep attachments, and the hay baler have greatly lightened the labour of harvesting.

Cowgrass seed production, which varied from 3000 to 13,000 acres during the earlier part of the period, received considerable stimulus during the later war years and production reached 26,500 acres in 1942-43. Before the introduction of certification the red clover was mainly of the hay type, but latterly the pasture or Montgomery type has assumed considerable importance.

White clover production also received a considerable impetus during the war and production, which previously had varied between 2000 and 10,000 acres, rose to 26,400 acres in 1942-43.

The production of rape, kale, chou moellier, turnip, and swede seeds was an important wartime development. Rape, kale, chou moellier, soft turnips, and swedes are very important fodder crops in the Dominion, as 500,000 acres are sown annually in those crops. The possibility of war cutting off seed supplies was foreseen and steps were taken to provide as far as possible for the Dominion's requirements.

Before the war all swede and turnip seed was imported from Great Britain and, with the threat of supplies being shut off, the Department of Agriculture took steps to ensure that sufficient seed was produced in the country to meet requirements. This work brought about the establishment of a new industry worth about £20,000 a year to the growers. The selection work in raising parent stocks was undertaken by the Department, which also supervised the growing and distribution of the seed. Results to date indicate that the quality of New Zealand-grown seed is at least equal to that of imported lines.

Chou moellier and kale seed have been raised on similar lines to swede and turnip seed. Before the war a programme of rape seed production under a certification scheme by the Department had already been started, though half the country's requirements were still imported. During the war more than enough rape seed was produced for the Dominion's needs, and in one season 300 tons were exported.

Hay and Silage

The area cut for hay and silage rose from about 162,000 acres in 1920-21 to 574,000 acres in 1943-44 or, roughly, in the 1920-21 season one acre was cut for every five and a half cows in milk and in 1943-44 one acre was cut for every three cows in milk. The greater reliance placed on hay and silage for supplementary feeding was the result of improved grassland farming practices. With the more widespread use of topdressing and truly perennial strains of ryegrass, long-rotation pastures were turned into permanent ones and the regular ploughing of pastures for renewal became no longer necessary. Supplementary forage cropping accordingly declined and was replaced by hay and silage cut from permanent pastures.

Though the making of silage had long been advocated for supplementary feeding on dairy farms, it did not become a common farm practice until the mid-1920's and then only because of the difficulty of handling surplus pasture growth as hay during uncertain weather in November and early December. Silage making increased rapidly up to 1932-33, when 116,000 acres were harvested, and then declined until in 1943-44 only 53,000 acres were cut. That decline has been largely caused by the high labour requirement for harvesting green material and, more recently, by the development of the pick-up hay baler, which allows of rapid harvesting and consequently lessens the weather hazards.

The tractor, with its accompanying mower and sweep attachment, and the hay baler have greatly lessened the work required on dairy farms for conserving both hay and silage, but their introduction has not yet had any very appreciable effect on the quantity saved per cow. In a survey covering tractors released to dairy farms during the latter war years it was found that the anticipated area for hay and silage per 100 cows for farms to which tractors were released was above the mean for the land districts as a whole but generally about the level of that for the most intensively-farmed county in each land district. The

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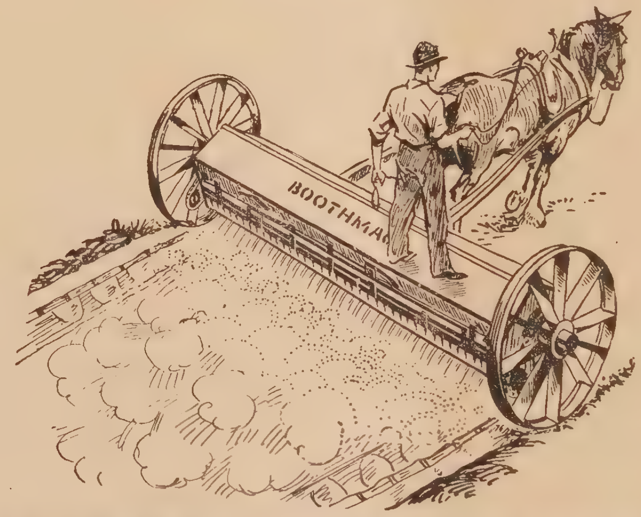

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area cut for hay and silage for farms previously with tractors and those previously without tractors for North Island land districts is given in Table XV.

TABLE XV—HAY AND SILAGE PER 100 DAIRY COWS

Land District	Farms receiving new tractors in 1944-45 Previously with tractors (acres)	 Previously without tractors (acres)	Average for land district (acres)
North Auckland	32.29	31.75	20.48
Auckland ..	39.40	39.82	34.49
Taranaki ..	44.55	43.20	36.72
Wellington ..	34.06	32.51	27.59

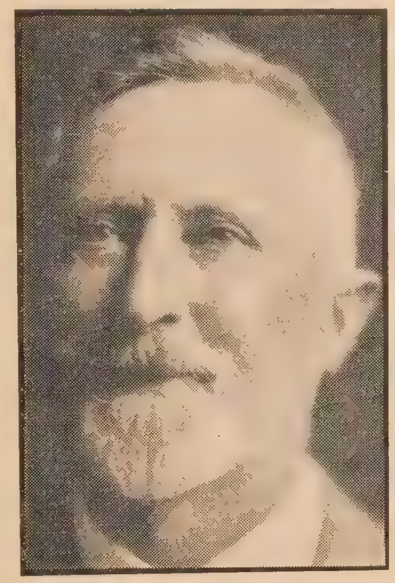
Dairy farming in North Auckland is not generally as intensive as in other districts; both dairy cows carried per 100 acres and hay and silage saved per 100 cows are lower than in other districts. The area of hay and silage saved per 100 cows varied from none in Great Barrier County and 4.84 acres in Hokianga County to 32.96 acres in Franklin County. It would appear from Table XV that on tractor-using farms in North Auckland the hay and silage provision per 100 cows approximates very closely that of the most intensively-farmed county in the area.

In the Auckland and Taranaki Land Districts the area of hay and silage saved per 100 cows on farms with tractors is higher than the average for the district and is even slightly above that saved in many highly-farmed counties—Matamata 38.13 acres, Piako 38.91 acres, and Waimate West 33.96 acres for the 1943-44 season.

Sheep and Wool

The effect of intensive grassland farming practices on sheep distribution has already been described, and the data given in Tables IV and X showed the marked rise in ewe numbers in districts with flat and undulating land as opposed to the stationary or declining numbers in certain districts where the main grazing lands consist of hill country. This movement in sheep distribution and concentration on the production of lamb for export led to certain changes in breeding practices—an increase in the use of Romney and Southdown rams and a decline in the percentage of dry sheep to breeding ewes. It has also increased the trade and made some alterations in the movement of store and breeding stock from the hills to the plains and downlands. Increased carrying capacity in the intensive grassland farming districts of the North Island now absorbs ewes which formerly were shipped from the surface-sown grasslands of the east coast of the North Island to the plains of the South Island.

There have also been significant changes in size of flock, reflecting the development of fattening farms in the intensive grassland farming areas, and the main increases in the number of flock owners have occurred in flocks of from 500 to 2500 ewes.



[*S. P. Andrew Ltd. photo.*

Sir William Perry, of Penrose, Masterton, made very important contributions to the improvement of the Romney breed of sheep and to the general advancement of the sheep industry in New Zealand. In a paper giving advice on sheep breeding he stated: "To establish and maintain at a high standard a flock of stud sheep, several conditions are essential. Selection and methods of breeding must be on good lines, and the soil must be of a nature to grow feed which will produce bone, flesh, and wool of the quantity and quality required. Climate, also, is important; sheep as a rule do not thrive well in a wet climate, nor do long-woolled sheep appear to be a success in a very hot climate."

Changes in Breeding Practices

Changes in breeding practices differ somewhat in the North and South Islands. Table XVI shows the changes in the North Island and Table XVII the changes in the South Island.

TABLE XVI—BREEDS OF SHEEP AS ILLUSTRATED BY RAMS AS A PERCENTAGE OF TOTAL RAMS (NORTH ISLAND)

Breed	1920 Per cent.	1930 Per cent.	1940 Per cent.	1945 Per cent.
Romney ..	72	69	67	66
Southdown	7	23	30	32
Half-bred	—	½	—	¼
Corriedale	¼	¾	¼	—
Merino ..	½	¼	—	—
Border Leicester	1	1	½	—
English Leicester	¾	1	½	—
Ryeland ..	—	½	½	¼
Lincoln ..	17	3	½	½
Shropshire	¼	½	—	—

In the North Island the period brought the final abandonment of the Romney-Lincoln cross as the grazier's flock ewe and its replacement by the Romney. As increasing numbers of ewes were grazed on intensively-managed grassland, the Southdown became the standard ram for mating with Romney ewes for the production of fat lambs. The Border and English Leicester, which previously had been used to a limited extent for this purpose, ceased to be of any importance. The only other feature of significance was a minor interest taken in the use of half-breds and Corriedales in the 1930's in an endeavour to meet the demand for fine wools, but the change was abandoned because of the general adverse climate for such sheep.

TABLE XVII—BREEDS OF SHEEP AS ILLUSTRATED BY RAMS AS A PERCENTAGE OF TOTAL RAMS (SOUTH ISLAND)

Breed	1920 Per cent.	1930 Per cent.	1940 Per cent.	1945 Per cent.
Romney ..	32	32	33	40
Southdown	2	7	22	25
Half-bred	11	11	12	10
Corriedale	10	15	12	9
Merino ..	7	10	6	5
Border Leicester	17	11	6	5
English Leicester	16	9	5	3
Ryeland ..	—	½	1	1½
Lincoln ..	2	½	—	—
Shropshire	2	3	1	½

Breeding methods in the South Island, which originally were very different, have tended to come closer to those of the North Island as intensive grassland farming has progressed. Sheep farming in the South Island started on a foundation of Merinos, but when mutton became important Merinos were largely replaced by half-breds and Corriedales on the extensive grazing runs and fat lamb and mutton were produced by the use of Border Leicester and English Leicester rams with half-bred and three-quarter-bred ewes. The period reviewed has shown a marked rise in the use of the Romney and the Southdown, reflecting the development of intensive grassland farming, and the decline of the importance of the Border and English Leicester for fat lamb production. There was also a significant rise in the use of fine-woolled sheep in the 1930's, following the demand for such wool, and a subsequent decline during the war years.

Dry Sheep

As might be expected from the increasing emphasis on fat lamb production, the percentage of dry ewes and wethers to breeding ewes declined markedly. Table XVIII gives the numbers of sheep by classes for the North and South Islands between 1925 and 1945.

TABLE XVIII—SHEEP NUMBERS BY CLASSES, NORTH AND SOUTH ISLANDS, 1925 and 1945

	North Island		South Island	
	(In thousands as at April 30)			
	1925	1945	1925	1945
Breeding ewes	7,464	11,890	6,251	8,976
Dry ewes ..	536	431	348	487
Wethers ..	1,659	1,387	1,404	1,139
Rams ..	198	332	157	228
Lambs ..	3,862	5,068	2,668	*4,037
Total sheep†	13,720	19,109	10,828	14,866

* Abnormally high at April 30 because of late season.

† Total is corrected to show actual total and not addition of column, which is to nearest thousand.

In the North Island while breeding ewes increased by more than 4,000,000 numbers of dry ewes and wethers declined. In part this decline was made up by increased attention to cattle on surface-sown grazing runs, but the decline in wethers has made it increasingly difficult to manage surface-sown hill country, where the wintering of cattle is a difficult problem.

In the South Island the percentage decline in wethers and dry ewes to breeding ewes has not been as marked as in the North Island, as cattle do not feature extensively in South Island pasture-control practices and there are areas of tussock grasslands which are suitable only for dry sheep grazing.

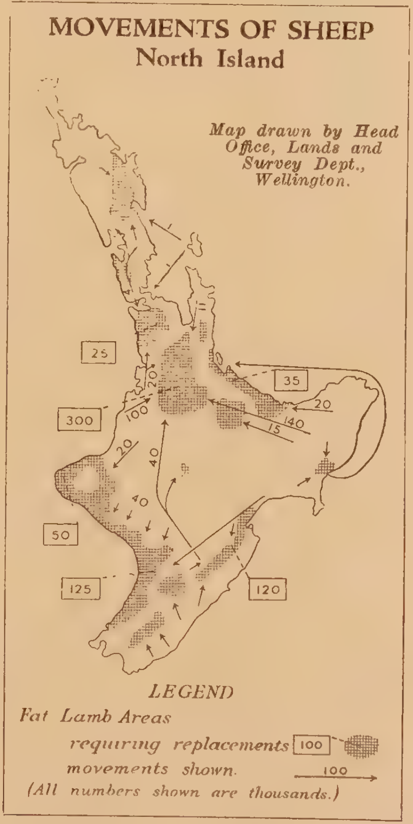
Movements of Sheep

At the start of the period, except for a proportion of the ewes bought for the Canterbury Plains, the intensive fat lamb producer secured his breeding ewes from the adjacent hill country. The Canterbury Plains, however, drew a considerable number of ewes from the East Cape district of the North Island, the Chatham Islands, and from Otago and Southland. With the improved carrying capacity of grassland in the intensively-farmed districts, the trade in ewes from the North Island to the South Island practically ceased and the Waikato absorbed an increasing proportion of the available ewes from the East Cape district. In round figures, probably more than half a million ewes travel considerable distances from the hill pasture lands to the fat lamb areas on the plains in the North Island. The main districts which buy in ewes from other districts (see map on this page) are South Auckland, Waikato, Central Plateau, Taranaki, and Manawatu. The principal districts supplying the necessary replacement ewes are East Cape, Hawke's Bay, the western uplands, the inland districts of Wanganui-Rangitikei, and the coastal section of the south-eastern end of the island. In the South Island movements of sheep are not now as extensive as they were but Canterbury still absorbs ewes from the Chatham Islands and from Otago.

Between 1920 and 1945 the number of sheep flocks increased from 23,960 to 32,383, as shown in Table XIX. The most important feature was the rise in the number of flocks in the groups 501 to 1000 and 1001 to 2500, which reflects the increasing importance of the family farm unit in sheep farming.

TABLE XIX—NUMBER OF FLOCKS, 1920-1945

Size of flock	1920	1930	1940	1945
1-200 ..	6,089	7,150	7,949	6,851
201-500 ..	6,197	7,184	7,656	7,109
501-1,000 ..	5,249	6,764	7,411	7,871
1,001-2,500 ..	4,411	6,318	6,734	8,060
2.501-5,000 ..	1,314	1,860	1,829	1,764
5,001-7,500 ..	388	456	412	440
7,501-10,000 ..	148	159	151	152
10,001-20,000 ..	139	151	127	120
20,001 and over	25	30	18	16
Totals	23,960	30,072	32,287	32,383


MOVEMENTS OF SHEEP
North Island

Map drawn by Head Office, Lands and Survey Dept., Wellington.

The chief factors influencing size of flock have been the increased carrying capacity of intensively-farmed grassland, sub-division of large estates, and in arable farming areas the relative prices for cereals and fat lambs. In districts devoted to fat lamb production the increased carrying capacity of grassland has tended to raise the number of flock owners in all classes up to flocks of 5000, while sub-division has reduced the number of large flocks. In arable farming districts flock size has been influenced by lamb prices: When prices for land rose flocks were increased in size and less land was devoted to cash cropping; when lamb prices fell flocks were reduced in size and more land devoted to cash crop production.

Wool

Wool production was naturally influenced by the increase in the number of sheep, particularly breeding ewes, between 1920 and 1945 and by changes in breeding practices. The recessions in wool prices in 1921-22 and again in the 1930's were severely felt by the extensive pastoralists who depended on wool for the main source of income, and particularly so by the producers of crossbred wool, for it was for this type of wool that the price recession was most sustained, particularly after 1928. The wool industry was not, therefore, in a particularly buoyant position in the immediate pre-war years, and a Royal Commission on the sheep farming industry was sitting when war broke out in 1939. The commission suspended work shortly after the outbreak of war, but its work has been resumed by another commission which began its sittings in 1947.

> **Complaints from manufacturers about the quality of New Zealand crossbred wool assumed importance shortly after the price recession of 1921, and that led to the critical examination of the quality of crossbred wool and the breeding practices involved in its production. The first research work was initiated by A. H. Cockayne and Sir William Perry, the well-known Romney breeder, and they indicated the need to eliminate the tendency for Romney flocks to produce "wool-hairs" (medullated fibres).**

Cockayne discussing the problem stated: " . . . The main objections to medullated fibres are four in number: They produce a harsh-handling fleece, they produce a dry, light fleece, they produce a non-elastic fibre, and they give a dull appearance to the fleece. . . . It is essential that all sheep breeders, particularly those with Romneys and Lincolns, should make every endeavour to breed out the tendency of their flocks to produce medullated fibres. In other words, they should aim at producing true wool rather than hair masquerading under the title of wool. . . . " With the establishment of the Department of Scientific and Industrial Research wool research work was widened, systematised, and centred chiefly at the agricultural colleges; it has resulted in the establishment of methods of wool testing and improvement of breeding practices.

Wool research and publicity were carried a stage further with the passing of the Wool Production Act, 1936, which levied 6d. a bale on wool and set up the New Zealand Wool Publicity Committee to administer the fund. In 1937 the International Wool Secretariat was formed, supported by the wool producers of Australia, New Zealand, and South Africa, to carry out wool publicity and research. The New Zealand body changed its name to the New Zealand Wool Council, which was replaced in 1944 by the New Zealand Wool Board on the passing of the Wool Industry Act.

The accumulation of wool stocks following the 1916-20 "wool commandeer" was finally disposed of by BAWRA in 1924 and normal auction methods of disposal continued until 1939, when the wartime appraisement scheme was introduced. Immediately war was declared Great Britain agreed to buy the whole of the Dominion's wool clip for the duration of the war and one season after. The initial price paid to the grower was fixed at an over-all average of 12.25d. a pound for greasy wool.

To implement this agreement the appraisement scheme was inaugurated and had a precedent in the "commandeer" scheme of 1916-20. During that period the necessary details had been worked out and thoroughly tested, so that a minimum of trial and error was required on the inauguration of the appraisement scheme, which continued to operate until the 1945-46 season. The Joint Organisation scheme now operates with the object of disposing of the wartime accumulation of stocks along with new clips as they come to hand each year. The aim is to stabilise prices by fixing a minimum reserve below which wool will be withdrawn from the market.

Beef Cattle

The increase of about 1,300,000 in the total number of cattle between 1920 and 1945 was mainly caused by increased numbers of dairy cows and their replacement stock. There was, however, some change in the distribution of beef cattle, for certain areas of rich alluvial land which in 1920 were used for beef cattle breeding and fattening were changed over to dairying, but that change was compensated for by increased attention to cattle raising by hill-country pastoralists, particularly on surface-sown land in the North Island. Beef production tended to become more strictly separated into enterprises which raised stores and enterprises devoted to fattening, on both of which cattle remained subsidiary to sheep.

In the North Island beef cattle are essential on the surface-sown pastoral farms for grassland control and generally early maturity is not the aim, for cattle from one and a half to two and a half years old are used for cleaning up rank pasture growth and crushing out undesirable vegetation in the summer and autumn. Cattle are also essential on North Island farms devoted to fat lamb raising, but, whereas the hill-country farmer usually maintains a proportion of about one cattle beast to every 10 sheep, the intensive fat lamb raiser may need only one cattle beast for every 15 to 20 sheep and frequently young dairy stock are used instead of beef cattle. On the other hand, in the lower-rainfall arable areas of the South Island the intensive fat lamb raiser controls surplus summer growth where necessary (and because of the lower general rainfall less control is required) by closing fields for grass and clover seed crops and does not usually maintain cattle for pasture control.

Table XX gives some idea of the relative importance of beef cattle in the general economy of pastoral farming.

TABLE XX—ESTIMATED NUMBER OF BEEF CATTLE PER 100 SHEEP SHORN BY LAND DISTRICTS

Land District	1920	1925	1930	1935	1940	1944
North Auckland	31	24	15	16	18	16
Auckland ..	32	22	16	14	13	11
Gisborne ..	8	10	9	12	12	13
Hawke's Bay	7	7	5	6	8	7
Taranaki ..	14	10	10	9	9	8
Wellington ..	8	8	7	7	8	7
Marlborough ..	2	2	2	2	2	3
Nelson ..	7	6	6	6	6	6
Westland ..	48	46	33	35	33	37
Canterbury ..	2	2	2	1	2	2
Otago	3	2	2	4	1	2
Southland ..	6	4	3	3	2	3

Reference to Tables IV, V, and X shows that during 1920-45 the increased carrying capacity in terms of breeding ewes and dairy cows occurred mainly on the intensively-farmed grassland areas on flat and gently-undulating land. Thus, in North Auckland and Auckland Land Districts there was a change from beef cattle to dairying on certain areas of flat alluvial land, and the majority of the increase in breeding ewes occurred on intensively-farmed grassland on flat and undulating country, where the proportion of cattle to sheep is usually lower than on hill country. Those factors account for the general fall in cattle-to-sheep ratio in these two land districts. However, in the Gisborne Land District, which is mainly devoted to sheep farming on surface-sown pastures, the proportion of cattle to sheep shorn has risen because of the more general recognition of the necessity for a high proportion of cattle to sheep on country liable to reversion. In other land districts any changes in proportion of cattle to sheep have not been important in relation to the number of stock involved.

With the improvement of pastures in the fattening districts and the development of the chilled meat trade, beef cattle herds have tended to contain a higher proportion of females and a lower proportion of steers older than two years. These tendencies developed during the late 1930's for during the depression period in the early part of the decade the proportion of older steers to total beef cattle rose, and that occurred again in the war years with the cessation of the chiller trade. Districts such as Gisborne which export young cattle have a higher percentage of female cattle than districts such as the Waikato which absorb young cattle for fattening.

The Pig Industry

The period covers an important phase in the expansion and improvement of the pig industry. In 1921 exports of pig meat were only 300 tons, but they rose fairly steadily until in each of the years 1936 and 1937 more than 30,000 tons were exported, and remained somewhat below that level until 1940, when the war and other factors led to a marked decline in exports. The rise and subsequent fall of production in the industry are illustrated in the following figures:—

Season	Sows one year and over intended for breeding
1920-21	50,000
1925-26	64,000
1930-31	65,000
1935-36	116,000
1940-41	100,000
1945-46	73,000

The rapid rise in sow numbers in the early 1930's was caused by increased attention paid to pigs because of the drop in butterfat prices and the development of the pork export industry. Toward the end of the 1920's a number of enthusiasts began to disseminate ideas and plans for improved methods of pig farming, and their efforts resulted in the formation first of the Waikato and Manawatu Pig Recording Associations in 1928 and in 1936 of the National Pig Industry Council, which functions through district councils and local clubs and provides a Dominion-wide service of instruction. This extension service led to improvements in the standard of breeding stock, equipment, and methods of feeding. Of particular importance has been the recognition of the need for production of root and fodder crops (supplemented with meat meal) to provide winter maintenance so that sufficient pigs can be wintered on dairy farms to utilise fully the seasonal supply of separated milk.

At the start of the war the United Kingdom Government agreed to buy all New Zealand's exportable surplus of meat products, but until the occupation of Denmark there was no exceptional demand for pig meats. When Denmark was occupied the United Kingdom requested increased production; output was raised to more than 1,005,000 carcasses in 1941 compared with 872,000 carcasses the previous season, and breeding sows were again brought back to more than 100,000. At that stage, because of the necessity of conserving shipping, the United Kingdom secured additional supplies

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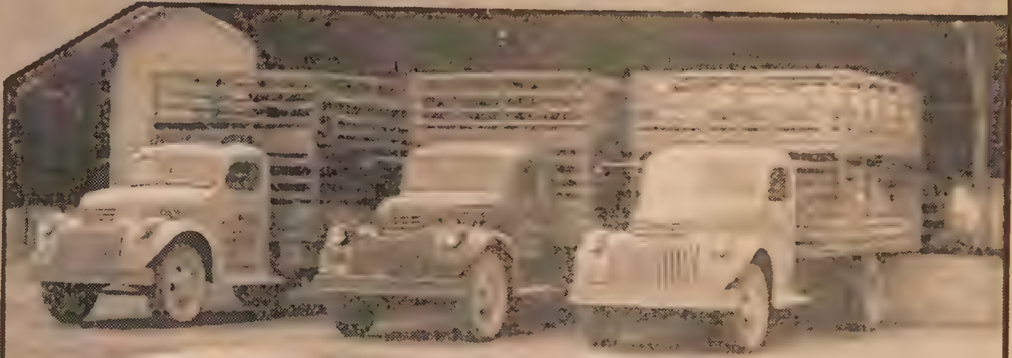

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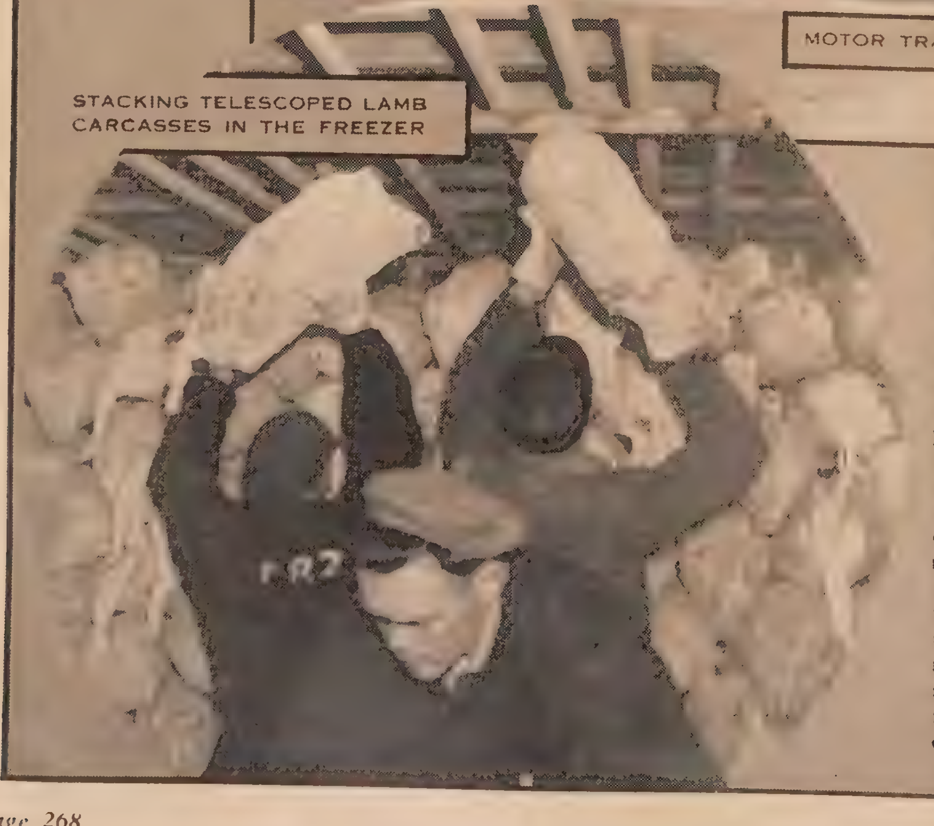


STACKING TELESCOPED LAMB CARCASSES IN THE FREEZER

New Zealand's annual kill of fat lambs is now between 11 and 12½ million and the expansion of the export trade in lamb was the most important feature in the development of the meat industry in the 1920-45 period. The increase in fat lamb production was a reflection of the increased carrying capacity of intensively-managed grassland. Ewe numbers in districts with flat and undulating land rose markedly, as opposed to stationary or declining numbers in most hill-country pastoral areas.

of pig meat from Canada and the United States, and New Zealand was informed that the export of pig meat was no longer required. That, with the change-over from butter to cheese in the following year and the change back again 12 months later, gave a general feeling of uncertainty in the pig industry. With the spread of the war to the Pacific it was again necessary to expand the industry, but great difficulty was experienced in recovering lost ground, particularly as labour became increasingly short.

With the end of the war, the general tendency for butterfat prices to rise, and more attention being paid to dried milk products, there has been no reversal of the tendency for sow numbers to decline. The decline of the industry has not been as great as sow numbers or pig slaughterings would indicate, as the higher proportion of baconers in the total kill lessened the fall in the total weight of pig meats produced.

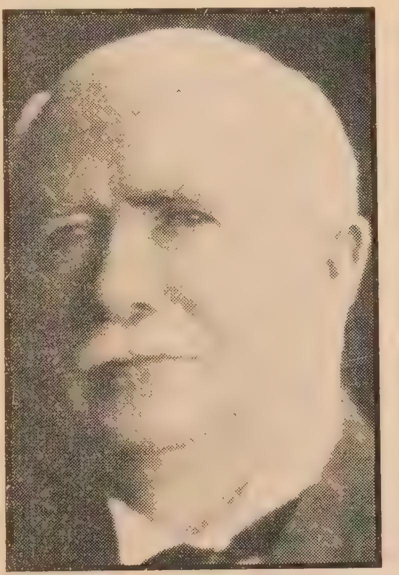
Meat Production and Marketing

The important features of meat production during 1920-45 were reflections of the increased carrying capacity of intensively-farmed grassland—the expansion of fat lamb production, export of chilled beef, and the contributions of beef, veal, and pig meat from an expanded dairying industry. At the end of the period annual killings (subject to seasonal influences) were approximately as follows:—

Cattle . . .	650-700 thousand.
Sheep . .	4½-5¼ million.
Lambs . . .	11-12¼ million.
Vealer calves	65-75 thousand.
Bobby calves	900-1000 thousand.
Pigs	650-700 thousand.

Meat (bone-in basis) and edible offals from these slaughterings would amount to about 535,000 tons, of which 175,000 tons are used locally and 360,000 tons exported. Average production for the six seasons (ending September 30) 1939-45 was 528,000 tons.

Meat exports were naturally influenced by changes in production, prices, local demand (which increased with rising population), and the two world wars. Exports of mutton, which exceeded 2,000,000cwt. in 1920, dropped to 1,500,000cwt. in 1945, while lamb exports rose from 1,300,000cwt. in 1920 to 3,300,000cwt. in 1945, reflecting both the change from mutton to lamb production and the increased local demand for mutton. Beef exports, which were about 750,000cwt. in the early 1920's, dropped to only 300,000cwt. in the depression years of the early 1930's, but rose again in the late 1930's as the chilled meat trade developed (the first shipment was made in 1933) and prices improved. The best export year for beef was 1940, when 1,300,000cwt. were exported, but after 1942 a large proportion of normal beef exports was diverted for the use of the American forces in the Pacific. The export of bobby calf veal was developed during the period and now 1,000,000 dairy calves are slaughtered annually for this purpose. Exports of pig meat, which were relatively unimportant in 1920, rose consistently until 1936, when 600,000cwt. were exported, but subsequently declined. Exports of preserved meat were greatly influenced by the world wars. In 1920 exports were high (11,600,000lb.) as accumulated war stocks were exported and then fell to 2,600,000lb. in the early depression years of the 1930's; during the Second World War exports again expanded, and in 1942 more than 36,800,000lb. were exported.



[S. P. Andrew Ltd. photo.

On January 10, 1922, the Rt. Hon. W. F. Massey presided at a conference of representatives of the primary producers and members of a parliamentary committee which recommended the establishment of a Meat Producers' Board. The Meat Export Control Act ("an Act to make provision for the appointment of a Meat Producers' Board, with power to control the meat trade") was passed on February 11, 1922.

The Imperial Government's requisition of New Zealand's exported produce ended in June, 1920, and almost immediately prices, which had reached high levels that year, fell. Faced with falling prices, producers felt the need for organised marketing, and the outcome of their difficulties was the establishment of the Meat Board in 1922. The board was given powers to assume the whole of the responsibility for marketing meat, but it never exercised its "absolute" powers. It raised and improved the standard of grading, negotiated freight rates, spread shipments and deliveries, and advertised New Zealand meat. Meat prices recovered in 1925 but fell again in the early 1930's as the United Kingdom market became glutted with produce. Great Britain, faced with the problem of saving her own farming industry, passed the Agricultural Marketing Acts of 1931 and 1933 and concluded with the Dominions the Ottawa Agreement of 1932. Under this agreement the Dominions were given preferential treatment and their products generally were exempted from the duties imposed on foreign food. Import quotas were instituted, but they were not really restrictive on New Zealand trade in meat until the immediate prewar years, when they were felt in the heavier grades of mutton and second-grade beef.

At the outbreak of war the New Zealand Government entered into contracts with the United Kingdom for the sale of its exportable surpluses of meat at agreed prices, with the understanding that prices were subject to review should increasing costs of imports from the United Kingdom prejudice New Zealand's financial position and also if at any time price increases were granted to other countries. Adverse price disparities between the Dominion's export and import prices soon appeared and grew as time passed. The matter was readjusted by consultation between the two Governments and took the form partly of price increases for exports and partly of lump sum payments.

The main features of the meat industry during the war were the ready clearance of much of the heavy-weight mutton and second-grade beef which was an embarrassment in the immediate pre-war years, an increase in meat canning, the temporary small-scale adoption of meat dehydration and the control and rationalisation of the buying of fat stock, the variations of weight schedules to conform to the demand for heavier slaughter weights, and the appointment of the Marketing Department as the authority in New Zealand for the bulk purchase and shipment of meat and other primary produce.

During the six war years 1939-40 to 1944-45 New Zealand supplied more than 2,000,000 tons of meat to the United Kingdom and United States Governments. The meat industry definitely expanded during the war and should remain in a very favourable position for a number of years. The bulk purchase agreement with the United Kingdom extends to 1950 and covers practically all the country's exportable supplies.

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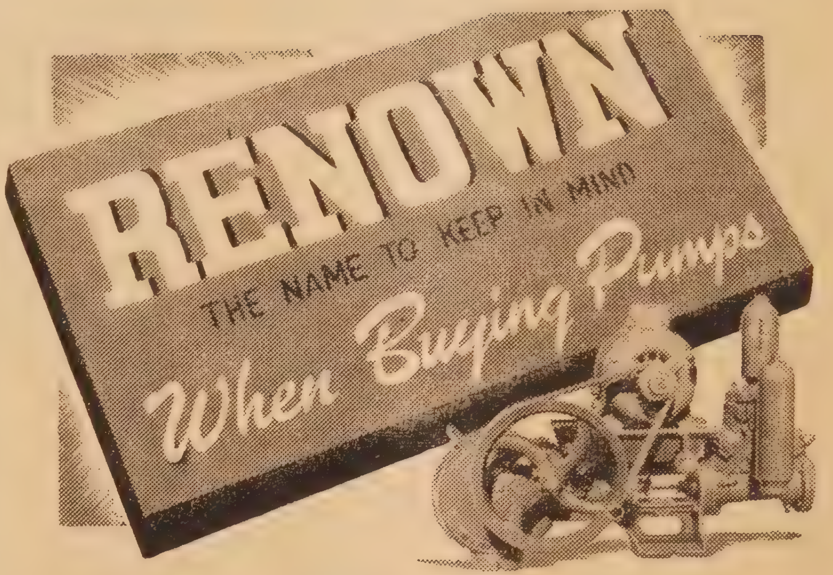

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The Mixing of Fertilisers for Single-dressing Applications

THE advantages of applying a single dressing of mixed fertiliser instead of multiple dressings of separate fertilisers are obvious. Nevertheless, to avoid loss of effectiveness or difficulty in handling, certain factors have to be considered by the farmer in the preparation of home-mixed fertilisers. These factors are dealt with in this article by E. B. Davies, Agricultural Chemist, Soil Fertility Research Station, Hamilton.

MIXED fertilisers applied in single dressings not only effect a saving in labour, but have the advantage of allowing the smaller amounts of some components to be distributed more evenly by being incorporated in a bulkier dressing. Furthermore, some salts that tend to become damp and pasty are conditioned (improved in texture) when mixed with fertiliser substances that absorb moisture, thus improving drilling qualities.

The farmer has the choice of buying factory-mixed fertilisers or mixing his own, but possibly the greatest advantage of home mixing is that it makes the farmer consider the whole question of his fertiliser programme much more thoroughly. He has to determine in what his soils are particularly deficient, whether they are too acid, the special requirements of the crops to be sown, and whether a rapidly- or a slowly-available fertiliser is needed. However, the farmer may design a formula for his special needs and arrange for a fertiliser firm to do the mixing. There are advantages in this, for difficulties such as the mixing of fine and coarse ingredients which tend to separate again are more readily overcome in the factory, but if the mixing can be carried out by farm labour in a slack period, and dry storage room is available, a saving will be made.

Fertilisers sometimes interact in a way likely to cause loss of effectiveness or difficulty in handling and certain mixtures as a result become undesirable. The accompanying chart indicates whether any two fertiliser ingredients can be mixed, but in order that the farmer may be guided in more complicated mixtures the various factors involved are explained below. It must be remembered that mixtures not recommended because they become wet may be made usable by adding a third component that is moisture-absorbing.

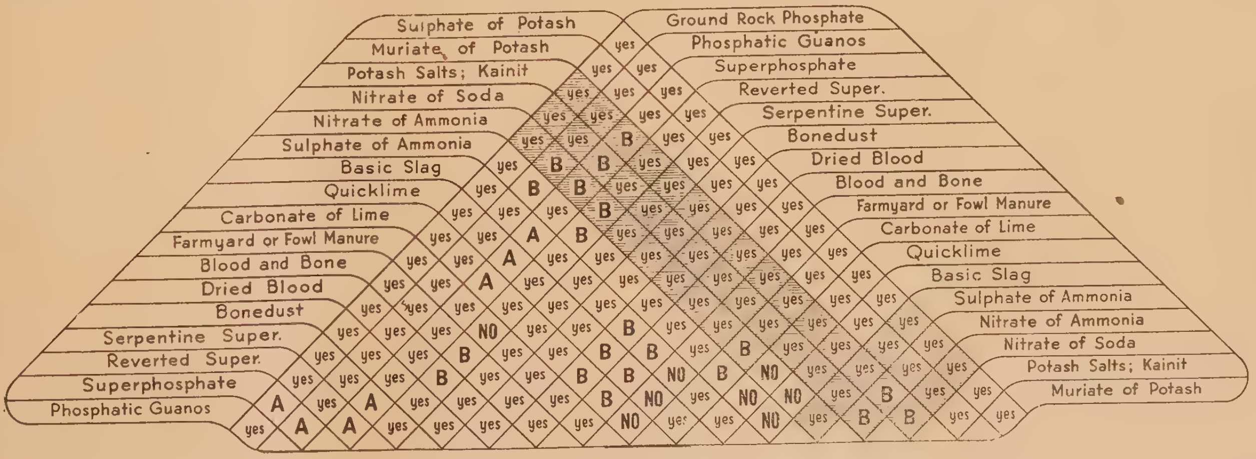
Reversion of Soluble Phosphates

It has usually been considered that water-soluble phosphates such as superphosphate are the most desirable, but of recent years reverted phosphates have been found to have advantages. They do not damage the bags in which they are stored, they do not cause germination injury, they are easily handled, and it is generally considered that they are not "fixed" (rendered unavailable) by the soil so readily. Therefore, unless a quick flush of growth is desired, there is no disadvantage in a phosphate becoming "reverted" to a less soluble form. Any substance containing free alkali such as quicklime, hydrated lime, and basic slag will bring about this reversion. Under moist conditions carbonate of lime and serpentine will also cause reversion. A reverted phosphate will itself revert superphosphate, because usually an excess of lime or serpentine will be present. If it is desired to keep superphosphate in its most soluble form, it must not be mixed with the materials mentioned above.

Superphosphate should not be mixed with nitrates, as loss of nitrogen is likely to occur and the product becomes pasty. Mixtures of sulphate of ammonia with superphosphate tend to cake if left for any length of time, the tendency being greater if potash salts such as kainit are also present.

Avoiding Moistness

Some fertilisers such as nitrate of soda, nitrate of ammonia, and kainit become moist or even liquid in damp weather and dry out again under less humid conditions. While moist they cannot be distributed easily and when they dry out they may form an extremely hard and intractable mass. In



	Ground Rock Phosphate	Phosphatic Guanos	Superphosphate	Reverted Super.	Serpentine Super.	Bonedust	Dried Blood	Blood and Bone	Farmyard or Fowl Manure	Carbonate of Lime	Quicklime	Basic Slag	Sulphate of Ammonia	Nitrate of Ammonia	Nitrate of Soda	Potash Salts; Kainit	Muriate of Potash
Sulphate of Potash	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Muriate of Potash	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	
Potash Salts; Kainit	yes	yes	B	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	B	B		
Nitrate of Soda	yes	yes	B	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	B			
Nitrate of Ammonia	yes	B	B	B	yes	yes	yes	yes	yes	B	B	B	yes				
Sulphate of Ammonia	yes	B	yes	B	yes	yes	yes	yes	yes	B	NO	NO					
Basic Slag	yes	yes	A	yes	yes	yes	B	B	NO	yes	yes						
Quicklime	yes	yes	A	yes	yes	yes	B	B	NO	yes							
Carbonate of Lime	yes	yes	A	yes	yes	yes	B	B	NO								
Farmyard or Fowl Manure	yes	yes	yes	NO	yes	yes	yes	yes									
Blood and Bone	yes	yes	yes	B	yes	yes	yes										
Dried Blood	yes	yes	yes	B	yes	yes											
Bonedust	yes	yes	yes	yes	yes												
Serpentine Super.	yes	yes	A	yes													
Reverted Super.	yes	yes	A														
Superphosphate	A	A															
Phosphatic Guanos	yes																

To find if two fertilisers can be mixed select the one of them which appears nearer the head of the left-hand column. The name will lead to a diagonal row of squares sloping down to the right. Place a ruler or pencil under this to mark it. Find the other fertiliser in the right-hand column and follow down the diagonal to the left. The answer will be found in the square where the two diagonals meet. All mixtures falling in the shaded area will tend to become damp in moist air and will cake on drying out. It is not desirable, therefore, to store them. This tendency will vary according to the proportion of potash salts, kainit, nitrate of soda, or nitrate of ammonia present. If these mixtures contain dried blood, bonedust, or blood and bone, they will remain in better condition, as these substances act as absorbents. A—The soluble phosphate will tend to revert to a less soluble form. B—These may be mixed, but only for immediate use.

THE MIXING OF FERTILISERS . . .

mixtures they may cause the same undesirable qualities, and should not generally be so used unless in comparatively small proportions or for immediate distribution. There are, however, some fertiliser ingredients such as bone meal and dried blood which absorb moisture and act as conditioners. By including these in a mixture the disadvantages of the ingredients which tend to become wet can be minimised.

Ammonia-containing Fertilisers

Substances containing free alkali (quicklime, hydrated lime, and basic slag) will liberate ammonia from ammonium salts and thus bring about a loss of nitrogen. They should therefore never be mixed with sulphate of ammonia, or nitrate of ammonia, or left mixed for any length of time with organic manures which form ammonia under suitable conditions, such as farmyard manure, blood and bone, and dried blood. Carbonate of lime or substances containing it may also lead to loss of ammonia under moist conditions and should not be mixed with sulphate of ammonia or nitrate of ammonia unless the mixture is to be applied soon after mixing.

Acid-forming Fertilisers

Some fertilisers, particularly those carrying ammonia, lead to loss of lime in the soil and increased acidity. Others like nitrate of soda reduce the acidity. If a mixed fertiliser is intended for a soil already fairly acid, a nitrogen carrier which will reduce rather than increase the acidity should be selected. Alternatively, a compensating amount of carbonate of lime could be incorporated, provided distribution followed mixing fairly closely. On the other hand, an acid-producing nitrogen carrier should be used for a crop of potatoes where an acid soil is desirable for scab control.

It has been estimated by Pierre (Industrial and Engineering Chemistry, 1933, Vol. 5, p. 229) that the acidifying effect of 1cwt. applications of sulphate of ammonia, nitrate of ammonia, and dried blood are counteracted by applications of limestone at the rates of 117lb., 62lb., and 22lb. respectively. Similarly, dressings of 1cwt. of nitrate of soda, nitrate of potash, and steamed bone flour, all of which reduce acidity, have the same effect as 29lb., 26lb., and 61lb. respectively of carbonate of lime.

The acidifying action of such fertilisers as superphosphate, mineral phosphate, and sulphate and chloride of potash is stated to be negligible. It has been repeatedly demonstrated that superphosphate does not increase the acidity of the soil.

Method of Mixing

The amounts of the various components needed can be judged sufficiently accurately from the weight per bag, half and quarter bags being estimated if necessary. If a fertiliser is lumpy, it should be broken up and sieved before being added to the mixture. Mixing is best done on a clean floor of close-fitting boards or of smooth concrete. The coarsest ingredient is first spread out in an even layer, the next coarsest spread on top, and so on, until all the portions are added. The mass is then turned with a shovel, working systematically across the heap. Three successive turnings should give adequate mixing. The mixture is then screened and bagged. If a large quantity of fertiliser is being made up, it should be mixed in several portions so that unwieldy amounts do not have to be handled. If the fertiliser is to be stored, it is essential that it be kept in a dry position.

☆

PEDIGREE SOW RECORDS

DURING November and December, 1947, 15 of the 20 litters of pigs recorded were sufficiently good to be included in one of the five grades set out below:

Grade	Minimum Litter Weight	
	At 3 weeks	At 8 weeks
1	120lb.	360lb.
2	100 ,,	300 ,,
3	90 ,,	270 ,,
4	80 ,,	240 ,,
5	70 ,,	240 ,,

Contributed by the Livestock Division.

Breed Averages for the Period

Breed	No. of Litters Recorded	Litter Weight at		Number of Pigs		Average Weight at	
		3 weeks (lb.)	8 weeks (lb.)	Born	Weaned	3 weeks (lb.)	8 weeks (lb.)
Berkshire	13	93	271	8.9	7.3	12.76	37.11
Large White	6	95	314	10.2	7.7	12.39	40.96

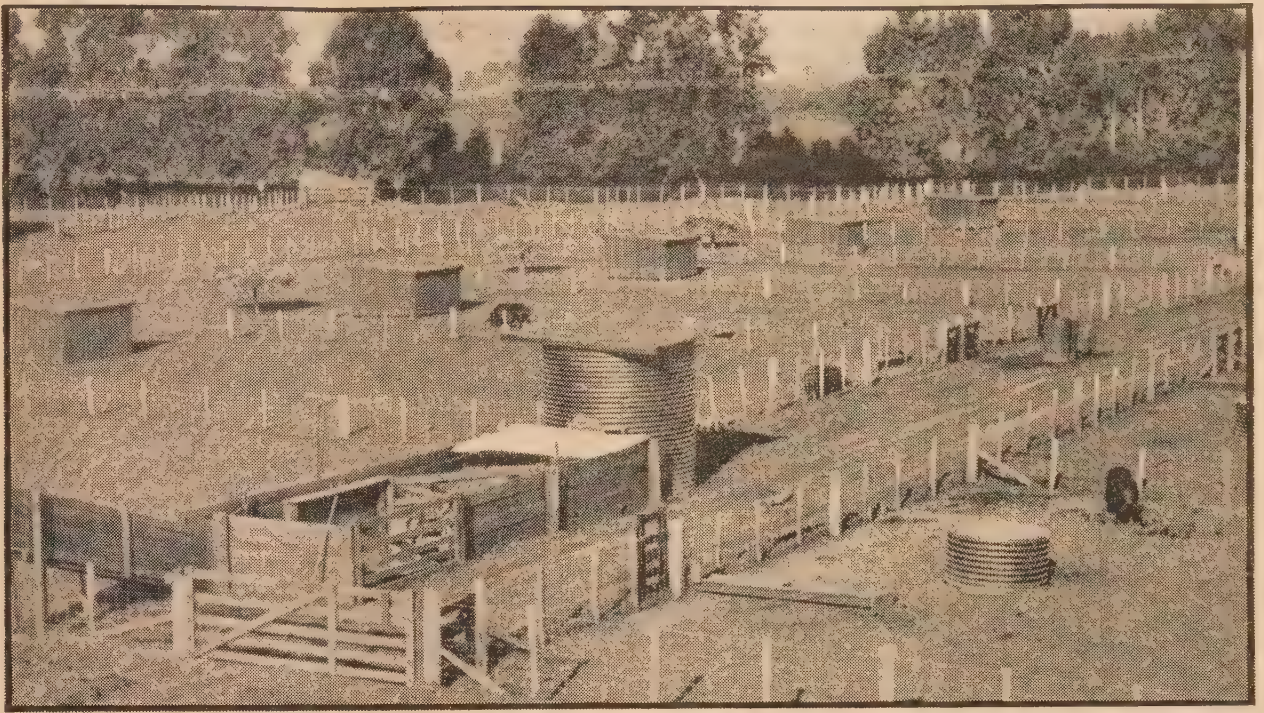
A No. 3 grade litter is regarded as a good performance, No. 2 as excellent, and No. 1 as special.

The following list gives the names and addresses of the breeders of recorded sows and details of the litters:

Owner's Name and Address	Herd Book Number of—		Litter Weight at		No. of Pigs		Grade of Litter
	Sire	Sow	3 weeks (lb.)	8 weeks (lb.)	Born	Weaned	
		Berkshire					
Ellerm, O. C., Sanson, R.D. Palmerston North	22745	22631	53	167	6	5	—
Ellerm, O. C., Sanson, R.D. Palmerston North	22745	22744	131	374	11	8	1
Ellerm, O. C., Sanson, R.D. Palmerston North	22745	22632	35	101	7	4	—
Warburton, K. L., Dairy Flat, Auckland	21880	23025	82	199	6	6	—
Davies, F. D., Buckland Road, Tuakau	22289	21316	108	349	10	9	2
Jones, J. H., Selwyn Street, Leeston	21411	21218	90	278	9	9	3
Cowan, G. T., Rotomanu, Westland	21917	20894	95	287	7	7	3
Cowan, G. T., Rotomanu, Westland	21917	21088	121	397	10	8	1
Cowan, G. T., Rotomanu, Westland	21917	18371	78	240	12	7	5
Bain and Son, J., Seddonville	21836	21688	81	203	7	7	—
Briggs, B., Seddonville	21368	20860	132	406	12	11	1
Hodgkinson, H. E., Rotomanu, Westland	18295	18278	106	257	9	7	4
Pitcaithly, R., Box 67, Eltham	22901	22091	100	267	10	7	4
		Large White					
Rowlands, T. E., Ruthin, R.D. Kaiapoi	*21227	6645	90	350	10	9	3
Rowlands, T. E., Ruthin, R.D. Kaiapoi	*21227	6646	105	331	10	9	2
Rowlands, T. E., Ruthin, R.D. Kaiapoi	*21227	7254	87	327	9	7	4
Levin Pig Club (secretary, B. Bartholomew, Box 14)	7097	7324	67	162	9	5	—
Twyman, W. A. H., Ngakuru, R.D. Rotorua	6993	6196	106	310	12	8	2
Shepherd, F. P., Sunnyvale Road, Massey, Henderson	6956	6910	115	404	11	8	2
		Tamworth					
Manship, G., Hari Hari	13754	13728	82	225	10	5	5

* Berkshire cross.

Improvements in the Housing of Pigs



THE first concerted movement to improve the conditions under which pigs were kept in New Zealand was made about 20 years ago. Before that conditions for handling pigs were somewhat primitive on most farms and little thought was given to the wellbeing of the pigs or the saving of labour. Usually some primitive type of wooden sty was "knocked together" in an odd corner where the land was not worth much, and if the pigs were allowed out of the sty, it was in a small pen rooted into mudholes where it was not covered with blackberry or other weeds. If the pigs were bred outside, the sow had to make her bed under a hedge or in an old tank, and at weaning the weaners had to be caught at the trough and "dumped" into the sty. Other management operations were equally primitive.

By A. LONGWILL, *Assistant Superintendent of the Pig Industry, Wellington.*

STRIKING improvement has been made in the housing of pigs in New Zealand during the past 20 years, and much of the credit for initiating the movement and showing that building better conditions for pigs was worth while must go to the three original pig-recording clubs. Working independently, each developed designs of housing and layout to suit its district. The layouts gave varying degrees of control over the pigs, but tended to break away from the sty out of which the pigs were never allowed. Much more emphasis was placed on the need for an area of good grass sub-divided into small runs for each litter. The main reason for that was maintenance of health by the provision of clean, open-air conditions.

Under the National Pig Industry Council and district pig council organisation the tendency to develop types of housing which are largely the design of the particular pig council supervisor as most suitable for conditions in his district has continued. At the outset supervisors were interested in improving housing as fundamental to better pig husbandry, and after a year or two in the field they pooled their knowledge with that of officers of the Department of Agriculture. The result was the publication by the Department in 1939 of Bulletin 177, "Layout and Construction of Modern Piggeries," which contained a wide variety of designs to suit all conditions. Amendments to the original designs have been tried out in all districts and, where improvements result, have been generally adopted. Thus considerable changes in general principle and in detail have taken place and must be incorporated in present-day recommendations, so a revised edition of Bulletin 177 is being prepared and it is hoped will be available toward the end of this year.

More critical examination of the suitability of designs for any set of conditions is required in future, but the designs now recommended are based on wide practical experience in the field. No design can possibly give better results than the management of the pigs and piggery will permit, so that probably a variety of modifications, based on uniform general principles, will remain. The modifications will depend on conditions of working on the farm, and the farmer himself will have his own way of working. Therefore, modifications to suit the individual as well as the factors usually considered—soil type, aspect, climate, type of production aimed at, type of feed supply, cost, and depreciation—must be admitted.

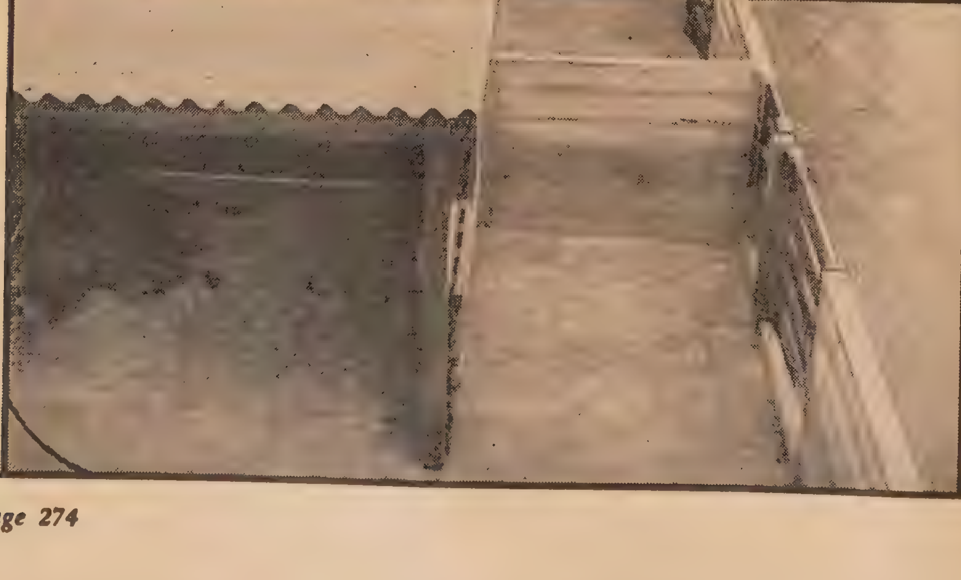
HEADING PHOTOGRAPH

The Waikato open-air layout. Pens were maintained in good condition for a number of years in this well-managed whey piggery near Eureka.

FARROWING LAYOUTS

Above—A modification of the Manawatu type of piggery using the central yard with each farrowing house, with alternate grass runs for each house. The fattening house is in the right background.

Right — Layout built by Messrs. Lange and Tambour at Waimauku concentrates farrowing pens on either side of feeding race and provides grass run-out from each.



Left — In Mr. A. T. Rogers's layout units have creep situated as shown here. The partition shown fastened back to side of house swings across 4ft. passage to form creep at further end.

IMPROVEMENTS IN PIG HOUSING

In this unit, shown under construction, access from sleeping quarters to creep will be under the roof, which will extend over the creep. The interior wall will not extend above its present height. The top half of the outside wall will have a door to allow access to the creep for feeding.

Basic Requirements

The general principles which should govern the design of any piggery, whatever the type, may be listed briefly as follows:—

1. Drainage and sanitation must be provided so that the health of pigs can be maintained with the minimum of difficulty over the whole life of the piggery.

2. Houses must be draughtproof but well ventilated. Floors and walls with which the animals come in contact must be of such construction that they do not "strike cold" on the pigs—the object being to maintain the surroundings and body temperature of the pig at as uniform a level as possible—and can be cleaned and disinfected thoroughly with the minimum of trouble. Sufficient sub-division must be provided to avoid mixing pigs of different sizes and carrying large numbers together. Overcrowding should be avoided. If an 8ft. x 8ft. sleeping floor is accepted as standard, it should accommodate either the sow and litter with the farrowing rail in position or, with the rail removed, up to 12 porkers or eight baconers. A newly-weaned litter does not require more than half this floor space and some provision should be made for restricting the sleeping space if they show signs of soiling their bed. Sunlight should be admitted to the houses as much as possible. Open-fronted houses should face east, or a little north of east, to get the morning sun. Double-range Danish-type houses should have their long axes north and south and windows, hung to fall inward between hopper checks, should occupy not less than one-third of the east-west wall space above 3ft. 6in. from the ground. The height of stud should be sufficient to enable ease of movement for the man who has to clean out, but it should be no greater because excessive air space makes control of the temperature in the house more difficult. Research in this respect is still required to define the best design for the varying climatic conditions in this country.

3. The whole layout must be designed so that the type of production planned can be carried out without waste of labour. The type of housing and layout decided on must take account not only of first cost but of annual costs, including maintenance, depreciation, labour, and general working costs.

These three main principles could be elaborated at much greater length, but it will serve best to consider some of the designs in use in the light of these principles.

Waikato Open-air Layout

The Waikato open-air design and that adopted in Canterbury were based mainly on the need to get right away from the old, insanitary sty conditions. They aimed at giving the pigs good, clean grazing. Where properly managed, with alternate runs to each house, which was placed at the rear of the paddocks, and where sheep or other stock were used to control surplus grass growth as necessary, they gave and in some cases still give satisfactory results on the free-draining types of soil for which they were designed. They met the requirements outlined very well for Waikato conditions.

However, with increasing labour costs and the high cost and shortage of wire and other material, maintenance and working costs in this type of layout have increased greatly, and the tendency has been markedly in the direction of centralised housing with occasional run-out on an extensive system.

Manawatu-type Layout

The type of layout recommended by the Manawatu-Oroua Pig Recording Club consisted of fixed wooden farrowing houses with a fenced concrete yard attached and placed in pairs on either side of a central race. A central fattening house draining to the front was provided. Each farrowing pen had a separate grass run of about one-fifteenth of an acre and provision was also made for alternate run-out from the fattening pens.

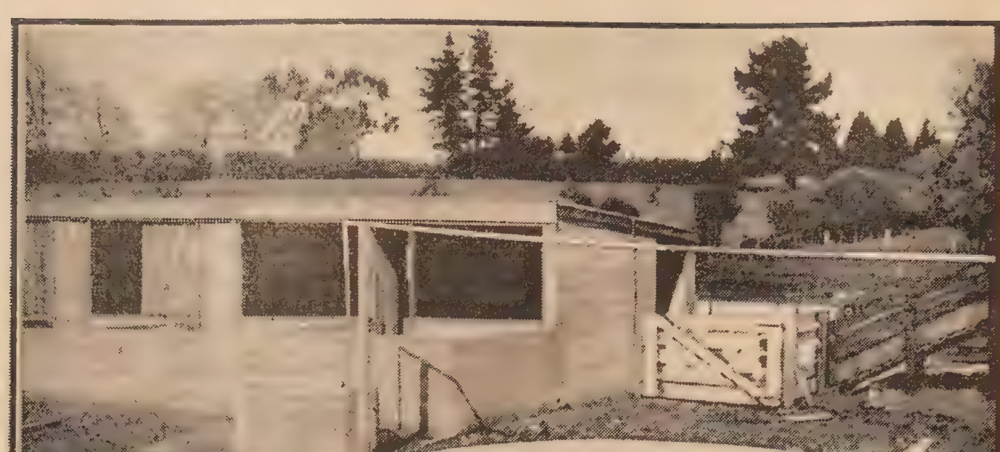
Where the design incorporated provision for draining all water falling on roof and concrete yard into drains outside the pens, so that wallow holes round the unit were avoided, this layout worked well. The essential principle of having a high degree of control over the pig from birth to slaughter has been retained in further developments. The Lange and Tambour layout for farrowing a large number of sows in a commercial piggery used the same principle, but concentrated the units on either side of a 2ft. 6in. concrete feeding race, drainage being carried in a 16in. wide shallow drain on either side of this.

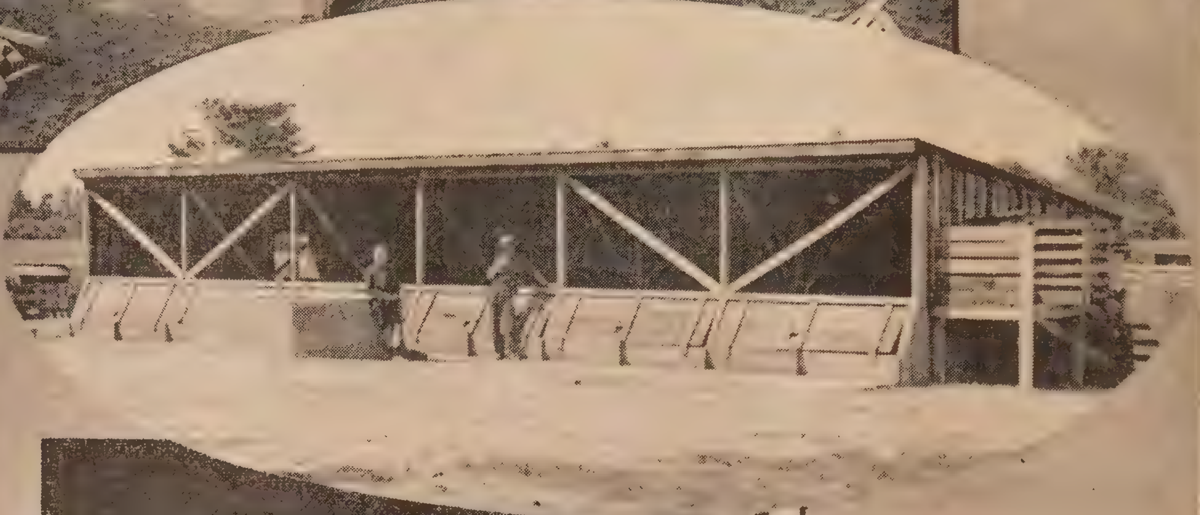
This system of "centralised single units" has been adopted by a number of large commercial piggeries which have made alterations or additions in recent years. A number of minor changes have been made to suit conditions, but perhaps the most significant is the changing of the site of the creep from the further end of the yard to a position between the sleeping quarters and the feeding race. The new plan, with various modifications, including the roofing over of the creep, is being widely adopted in new farrowing accommodation being erected at present.

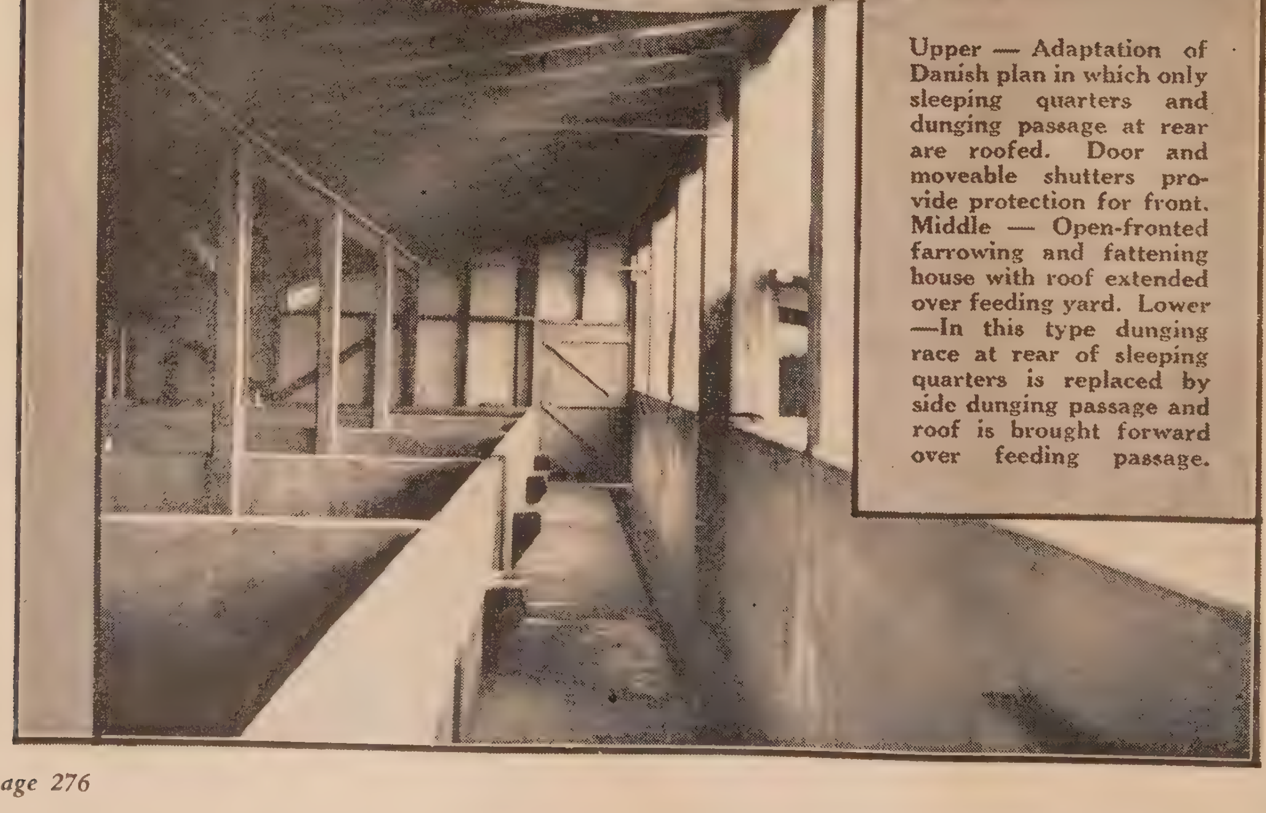
Farrowing House

The farrowing dates best suited to the seasonal feed supply are May-June and November-December, the first litters being sold at baconer weights, as the sows and their second litters can consume the total feed available.

FATTENING HOUSE LAYOUTS







Upper — Adaptation of Danish plan in which only sleeping quarters and dunging passage at rear are roofed. Door and moveable shutters provide protection for front. Middle — Open-fronted farrowing and fattening house with roof extended over feeding yard. Lower —In this type dunging race at rear of sleeping quarters is replaced by side dunging passage and roof is brought forward over feeding passage.

With proper organisation of feed supplies the second litters can be finished by the end of the dairying season, leaving only the breeding stock to be wintered. To follow this policy, however, it is essential that good farrowing accommodation be provided for the winter litters which are on the sows during May-June-July-August, enabling the sow and litter to be kept in the house when desired.

The plan of farrowing house with side creep roofed over and allowing access direct from sleeping quarters to creep, so that the piglets can use the creep without having to go outside in rough weather, meets the requirements stated very well. As it is desirable that all houses face in the same direction, these units are usually laid out in paired blocks on either side of the feeding race. On either side of the range of units grass runs are provided—one for each unit if materials allow. This layout of the farrowing pens is suitable for both large-scale commercial and small farm piggeries. The arrangement for allowing adequate run-out, while keeping each litter separate, is a valuable feature.

The wide yard accommodates a long trough, and each litter can be kept in the same house from birth to slaughter, as is frequently desired on the farm piggery.

Larger Types of Pig House

It is only a small step from the type of unit described, particularly where the creep is roofed over, to the modern type of multi-unit pig house in which a number of units are brought under one roof. Multi-unit construction, in fact, can be the cheaper because of the saving of walls, but that saving is more than offset if the roof is taken forward to cover the feeding yard and trough. If the feeding passage is roofed over, construction is still more expensive, but many farmers consider the added protection in wet weather warrants this expenditure.

The further the roof is taken forward the more difficult it is to arrange that ample sunlight reaches the sleeping quarters. Whereas 6ft. 6in. is sufficient stud height at the front of the sleeping quarters, 8ft. is required over the trough and 9ft. if the roof is taken over the feeding passage.

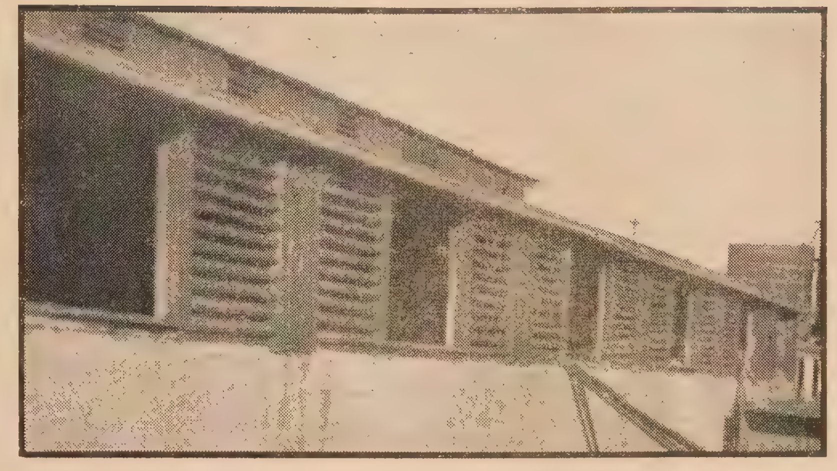
Danish-type House

A few farmers have built double-range pig houses on the Scandinavian plan. The first cost is relatively high but the expectation is that, by more effective control of the temperature in the house, better feed utilisation will be obtained than in the open-fronted type.

However, most of those built in this country, while adopting the ground plan, have departed from the Danish house in important respects. Insufficient lighting, no ceiling with loft space above, with its cushioning effect on temperature, and inadequate control over ventilation are noticeable faults in some of the houses of this type now in use in New Zealand. Those which have been carefully constructed with these points in mind, and are kept clean and sweet, are very efficient units.

Provision for handling, weighing, drafting, and loading the pigs should be incorporated in any type of central pig house or layout.

HOUSING OF PIGS



In this fully-roofed-over, double-range pig house the walls above 4ft. are built on the louvre principle and plenty of window space is allowed. The house is airy and well lighted.

Materials

While all materials are in short supply, increasing use of concrete has been made for piggery construction as far as cement supplies have permitted. The extreme shortage of wire for pig fences has undoubtedly been a factor in the trend toward concrete pig houses. Extensive run-out on one or two well-fenced cow paddocks has tended to replace the fenced pig run and has some undoubted advantages for the pig. Foundations and dwarf walls of concrete with wooden superstructure have been most common, though in some cases the whole walls and even the roof are made of concrete.

Methods of improvising where roofing material has been unobtainable have included laying sawdust or pumice concrete on sacks placed over ordinary sarking. The top is finally given a coat of bituminous paint to make it waterproof.

Concrete block walls are being built in a number of cases. Blocks can be made under cover in wet weather and rapid progress can be made when building is begun. Hollow-block construction should have some advantage for the walls surrounding sleeping quarters if they are properly laid to obtain the benefit of the cavity wall.

Warm floors are also of great importance in the sleeping quarters, and here coke breeze, laid with cavities as described in the February, 1947, issue of the "Journal," has proved its value. Sleeping floors should always be finished to a level 1½ to 2in. above that of the feeding yard, and where dunging passages are incorporated they should be set down a similar distance below the level of the communicating passage.

Expenditure Quickly Repaid

Steady progress has been made during the past 20 years in the improvement of the housing conditions and layout for handling pigs. This progress is still continuing in spite of shortages of material and labour. Though there are noticeable differences in detail, the general principles involved in the systems of housing favoured in different districts are much the same.

Farmers who have invested in new piggery accommodation soundly designed for their requirements have usually found that the investment quickly pays dividends. While food supplies have remained constant, increases in pig meat output of 25 to 30 per cent. over that obtained under the old conditions have been quite common. Thus the capital cost is recouped in three or four years.

The interest and enthusiasm which are present when new housing is provided must be maintained if the increased returns are to continue. Though a good plant will help both pigs and workers, the immediate management of the piggery is still the biggest factor in success.

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Surface Seeding of Pastures

By A. J. LYNCH, *Assistant Instructor in Agriculture, New Plymouth.*

THE present drive for food production to aid Britain has re-emphasised the need for maximum production from New Zealand's grasslands. Many old or run-out pastures will be considered critically by those in charge of them with a view to their improvement, and reseeding of such pastures may be necessary. The enormous potential wealth available from New Zealand's improved grass and clover strains should be tapped and exploited immediately. Reseeding of poor pastures with these strains can contribute largely to production and is sound from a business point of view.

FROM time immemorial the plough has been associated with seed sowing, and it remains unsurpassed as a cultivating implement preparatory to resowing. In certain circumstances, however, a short cut can be taken toward resowing without breaking up the original turf, and ploughing and subsequent cultivating can be disregarded. That is not an alternative to breaking up a paddock obviously run out and denuded of any of the sown species; there is then only one remedy, and that is the plough followed by complete resowing.

Very often a paddock reaches the stage when the farmer is dubious of ploughing but when the sown species are so weakened that the paddock obviously requires some attention in addition to topdressing. Pastures in that condition are frequently the lot of the man taking over a property which suffers from general neglect, and some immediate improvement over a big part of the property is necessary. Ploughing to such an extent obviously would be out of the question unless spread over a number of years. Heavy topdressing of pastures in this condition is likewise unsatisfactory because the sward is unable to respond to topdressing to the extent that a good sward would, particularly where it is weak in clover, and the net return from the topdressing programme is thus much lower. In such cases a light sowing of seed over the paddock may rejuvenate the sward sufficiently to warrant the small expense involved.

Such paddocks usually will be weak in either the grass or clover content in the first place, and at that stage remedial methods can best be applied. For instance, paddocks which must be closed during the winter months for spring feed usually lose a fair proportion of the clover in the sward. If that reduction is considerable, oversowing with 1 or 2lb. an acre of Certified white clover seed mixed with the autumn-applied fertiliser may restore the clover content sufficiently. If the decline in the clover content is not arrested, however, it will be reflected later in a similar reduction in the vigour and amount of grasses in the sward. Such a sward is typical of those which can be successfully rejuvenated by oversowing.

This practice has been successfully carried out on the light volcanic soils of North Taranaki, which are ideally suited to the purpose. Frequent showers of autumn rain also favour the establishment of the seedlings.

Method of Oversowing

The method usually adopted is as follows: The paddock is grazed out as much as possible in the autumn so that work can continue on it in March—about the time pastures are usually sown down. It is then given one or two strokes with a set of discs, or preferably grassland harrows, but they must be sufficiently drastic in their action to provide some sort of tilth for the seed. The amount of seed sown varies from 10 to 20lb. according to the original condition of the paddock, usually only perennial ryegrass, Italian or short-rotation ryegrass, and white clover being sown. A typical mixture would be:—

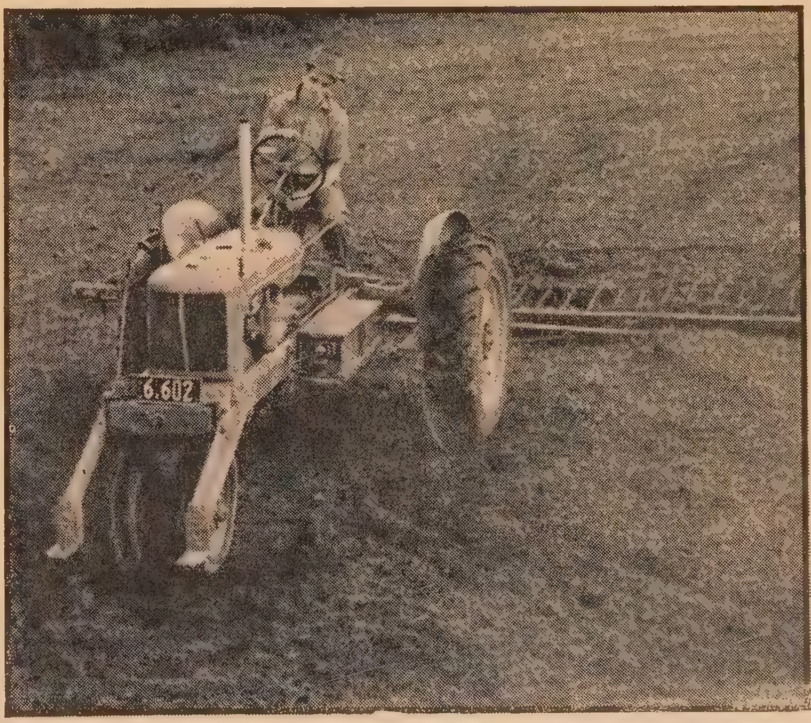
	lb. an acre
Certified perennial ryegrass ..	8
Italian or short-rotation ryegrass	5
White clover	2
Total	15

A simpler mixture of 13lb. of Certified perennial ryegrass and 2lb. of Certified white clover could be sown.

After being sown the paddock is topdressed and closed from stock until the seed is well established. However, the after-management is probably more important than the previous cultivation, and the field should be treated as a new pasture until the following spring, allowing sufficient growth to come away without smothering the seedling plants.

The success or failure of this method is more dependent on the weather than is sowing on cultivated ground, and for that reason spring sowing cannot be recommended, as the seedling plants are very sensitive to hot, dry weather. In addition, growth in spring is so rapid that the seedling plants may be either smothered or damaged by grazing. Management at this time presents quite a problem.

Surface sowing has given satisfactory results with ample topdressing and lenient grazing under these conditions of soil and climate, but it is an alternative to complete renewal only where the pasture is not completely impoverished; where that is so, ploughing and resowing offer a surer method of pasture improvement.



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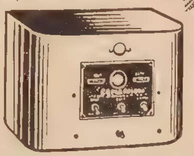

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RECENT research by the New Zealand Department of Agriculture has proved that milking inflations should be changed regularly. It has been found that slack inflations tend to slow up milking, and slow milking tends to cause "strippy" cows and lower production. Old inflations harbour bacteria and, when slack, could result in increased mastitis. Dirty inflations cause second-grade milk.
The Department recommends that inflations be changed every six weeks if milking up to 15 cows per set per milking; more frequently if more cows are milked.

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THE CULTURE OF WALNUT TREES

By S. FREW,
Orchard Instructor, Blenheim.

THE commercial production of walnuts has by no means reached saturation point in New Zealand despite the numerous large and beautiful trees which abound in many districts, especially Marlborough, Canterbury, and Hawke's Bay. Very few trees have been planted in late years, however, and the major supply of walnuts comes from these old, mature trees which in the main are of doubtful origin, most of them probably being seedlings of the English species *(Juglans regia).* The introduction and propagation of some of the better varieties and more diligent culture of existing mature trees would go a long way toward reducing the present shortage in production.

NEW ZEALAND has never been self-supporting in walnut production and before the war large quantities were imported, principally from China. At present there is an extreme shortage, leaving an obvious opportunity for expansion of production. Walnut growing has not been practised extensively in New Zealand, and, though there are records of walnuts being planted by the early settlers in the 1840's, those and subsequent plantings were confined mainly to odd trees in private gardens.

Lines of Expansion

The extent to which this individual-tree production obtains may be gauged by the recorded number of trees in Marlborough district. More than 500, mainly of the English variety, all large and of mature age, are growing around the town of Blenheim and on the Wairau Plains, mostly in small groups of one or two trees, with a few plantations of up to 15 or 20 trees. About 20 tons of nuts are harvested and sold annually from these trees, and there is no doubt that if unfruitful trees were replaced and some care and attention devoted to the remainder that tonnage could be doubled.

Undoubtedly there is room for an extension of planting, as well as the replacement of unfruitful trees. The establishment of further trees, however, should not be undertaken haphazardly, as has happened in the past, and some consideration should be given to the selection of a favourable site and the type and variety most suitable and to general cultural methods so that the highest standard of production may be attained in the future.

An English walnut tree growing in Blenheim, Marlborough. This tree produced more than 400lb. of nuts in 1947.

Selection of Site

Several factors must be considered before planting. These are:—

Climate: The chief climatic limitations to successful walnut culture are frosts and extreme heat, but as the temperature may exceed 100 degrees F. without causing any harm, few parts of New Zealand should prove too hot for walnut production, and the main factor to be considered is the avoidance of the frost risk.

Rainfall: Areas with a moderate rainfall—20 to 30in. annually—are preferable. The walnut tree, being heavily foliated, requires considerable soil moisture through the growing period. On the other hand walnut blight (bacteriosis) thrives in a moist climate, and areas with a very heavy rainfall should be avoided.

Soil: Walnuts will grow in a variety of soils, but prefer a deep heavy loam, rich in organic matter. Shallow soils, unless overlying a very friable clay subsoil, are unsuitable, as also are sandy soils.

Site: The susceptibility of walnuts to frost damage must influence selection of site. Areas subject to heavy or late frosts should be avoided at all costs.

Drainage: The walnut tree is deep rooted and good drainage is essential. Not only will the tree thrive better, but it will be less susceptible to blight if growing on well-drained land.

Types of Walnuts

The main types of walnuts grown are:—

Species

Juglans regia (common walnut): Spreading trees (English).

Juglans nigra (black walnut) and *Juglans californica* (black American walnut): Large, erect trees with deeply-furrowed bark. The nut has a thick husk with a hard, deep-furrowed shell. A good root stock for *J. regia.*

Juglans cinerea (butter nut): A small kind.

Juglans sieboldiana (Japanese): Bears long clusters of nuts. The nut has a very hard, smooth, elongated shell.

Hybrids

Paradox (*J. regia* x *J. nigra*): A large tree, slow to bear, with a poor-quality nut.

Royal (*J. nigra* x *J. californica*): A vigorous tree carrying heavy crops.

From some of the types listed many good varieties have been developed, and in America *Juglans nigra*, or black walnut, has proved the most desirable as a root stock. In New Zealand, however, it has still to be proved whether this stock has any advantages over root stocks produced from nuts from the more vigorous of seeding trees.

Choice of Variety

These are the main points to consider when selecting varieties for planting:

Quality: Though the English varities produce very handsome trees, commercially they are often somewhat disappointing. In the main they have been raised from nuts and, because they grew from seedlings, their unreliability is reflected in their uncertain habits. They may bear good, bad, or indifferent nuts and may not crop for 15 to 20 years, if at all. In addition, they are usually very susceptible to walnut blight, the principal disease of the walnut. No known English variety is immune from this trouble, and not many show any great resistance.

On the other hand, Californian and French varieties are usually raised vegetatively and as a consequence remain true to type, and in addition they usually bear within five to ten years. Some of these varieties are excellent croppers, producing a high-quality nut, and are far more resistant to blight, the American varieties being practically immune.

Early Cropping: As no one wishes to wait a decade or more before obtaining a crop from newly-planted trees, varieties which come into bearing in the minimum of time are preferable. Most varieties do not bear male flowers during the first five years, but two varieties, Woodland and Melanaise, are known to do so at a very early age, and their inclusion in any walnut plantation is a decided advantage to pollination.

Frost Resistance: Walnut trees are quite hardy, but the blossoms will not stand a heavy frost. Two or three degrees of frost for one hour have been known to injure the young shoots and flowers seriously. Some varieties, however, are quite late in coming into leaf and consequently may be considered more frost-resistant, the danger of frost injury being confined to an unusually late frost. The selection of late-leafing varieties, therefore, is an important factor in districts which are subject to these cold periods.

Immunity from Disease: Unfortunately immunity from disease can be obtained only with American strains, and as many good-quality trees are included in the French varieties of *J. regia,* all that can be done is to select the least susceptible.

Varietal Characteristics

Suitable varieties which overseas fulfil the requirements noted are contained in the following list, but few of these are offered by New Zealand nurserymen at present:—

Woodland (American): A good-quality nut. The tree produces male flowers in its early years and is resistant to blight. Interplanted with others it may help to induce early cropping. This variety is an asset in any plantation.

Franquette (French): A heavy cropper of good-quality nuts, large, elongated, and pointed, with smooth shells. Comes into leaf late and consequently is somewhat frost resistant.

Mayette (French): Bears large, slightly-elongated nuts with a flat base and comes into leaf late. One of the least susceptible to blight.

Melanaise (French): Has nuts similar to Mayette but more rounded. A more vigorous grower, producing male flowers in early years. Suitable for interplanting for pollination. Comes into leaf late.

Treyve (French): Nuts similar to Mayette but more elongated. A pure white kernel and an attractive nut, but the tree is less prolific than the other varieties listed. Comes into leaf late.

Paper-shell (English): A very superior variety with a thin shell and full kernel. Unfortunately susceptible to blight.

Wilson's Wonder: A heavy cropper of good-quality nuts.

Royal (American hybrid): A vigorous grower and heavy cropper of medium-quality nuts. Immune to blight.

Other good varieties which have done well in Australia and may prove suitable to New Zealand conditions are Concord, Payne, Eureka, Placetia, and Freshford Gem.

If none of the varieties listed is available, trees may be propagated by using wood taken from some heavily-cropping trees of proven good quality and top working this variety or strain on to root stocks raised by sowing nuts from any outstanding vigorous type of tree available.

The advantages of growing truly-named and tested varieties raised vegetatively from trees of proven worth cannot be stressed too strongly, and every endeavour should be made to secure these types instead of continuing to raise plants from nuts, as many of these are likely to be worthless.

Propagation of Trees

Anyone wishing to plant walnuts would be well advised to obtain trees from a reliable nurseryman, but if it is desired to raise the trees, stocks must first be grown. That may be done by obtaining nuts from a strong, quick-growing tree and stratifying them in sand as soon as they are ripe.

Fill a large earthenware crock with alternate layers of nuts and slightly-damp sand, starting with 2in. of sand, then a layer of nuts three or four deep, then successive layers of sand and nuts, finishing off with 2in. of sand. The pot should then be placed in a cool place. Early in September the nuts should be sown 6in. apart in rows 2ft. apart in ground which has been deeply dug, well drained, and limed. The nuts will then germinate freely and by the following winter the plants can either be lifted and planted out or left for another year in the nursery rows. When the stocks have attained a diameter of at least 1in. the desired variety can be top-worked on to them by budding.

Grafting as practised with many other types of plants is unreliable with walnuts, the percentage of "takes" being small, but if it is to be attemped, grafting below ground level is advised. Budding, however, is reasonably reliable if done during the late summer, provided that patch budding is practised. Patch budding is merely a variation of ordinary budding, and

Portion of the tree illustrated on the first page of this article, showing the heavy crop of nuts borne again this year.

consists of taking the selected bud with an oblong section of the bark, removing a similarly-shaped section of bark from the stock, and fitting the patch bud into its place. The bud should be tied in place in the normal way. When the bud has made sufficient growth and the old top growth of the stock has been removed, the tip of the new shoot should be pinched out to induce it to produce more main branches.

The soil should be worked up to a fine tilth and the young trees planted during the dormant season in holes 2ft. square and 1ft. deep. The long tap root should be shortened to 1ft. and other big roots trimmed. Watering the newly-planted tree before the hole has been completely filled is also advisable. As some varieties are self sterile, it is advisable to plant two or more varieties in close proximity. The spacing should not be less than 40ft. between trees.

Cultivation and Pruning

For the first few years after being planted the trees should be cultivated for a radius of 4ft. Occasional dressings of lime will prove advantageous.

Until the tree reaches maturity (from 10 years onward) some pruning is beneficial. It should be done in the early summer by pinching back the side shoots which grow from the main limbs, to promote the formation of fruit spurs, and removing shoots from the lower portion of the tree and limbs which are overcrowded or crossing.

Mature trees should not be cut heavily, but if necessary this work should be done in the autumn to minimise the risk of bleeding.

Harvesting

Harvesting is usually a very simple operation. When the nuts mature the hulls split open and release the nuts, which fall to the ground. The fall of nuts can be accelerated by shaking the limbs with poles with hooks attached. It is common overseas to beat or "brutt" walnut trees with sticks at picking time, but that has nothing to commend it, causing much damage to young shoots and tending to increase disease.

The nuts should not be allowed to remain on the ground for a long time, but should be stored in a dry place, preferably on racks allowing free air circulation.

Some of the nuts when harvested will not be entirely free from adhering hulls. These will usually become detached during storage, but if any remain completely attached the nuts should be culled out from the main sample, as there is usually a high proportion of mouldy kernels among them.

Efficient bleaching will transform nuts into a most attractive product. They should be immersed for 5 to 10 seconds in a solution of bleaching powder composed of chloride of lime and trisodium carbonate (½lb. of each to 4 gallons of water).

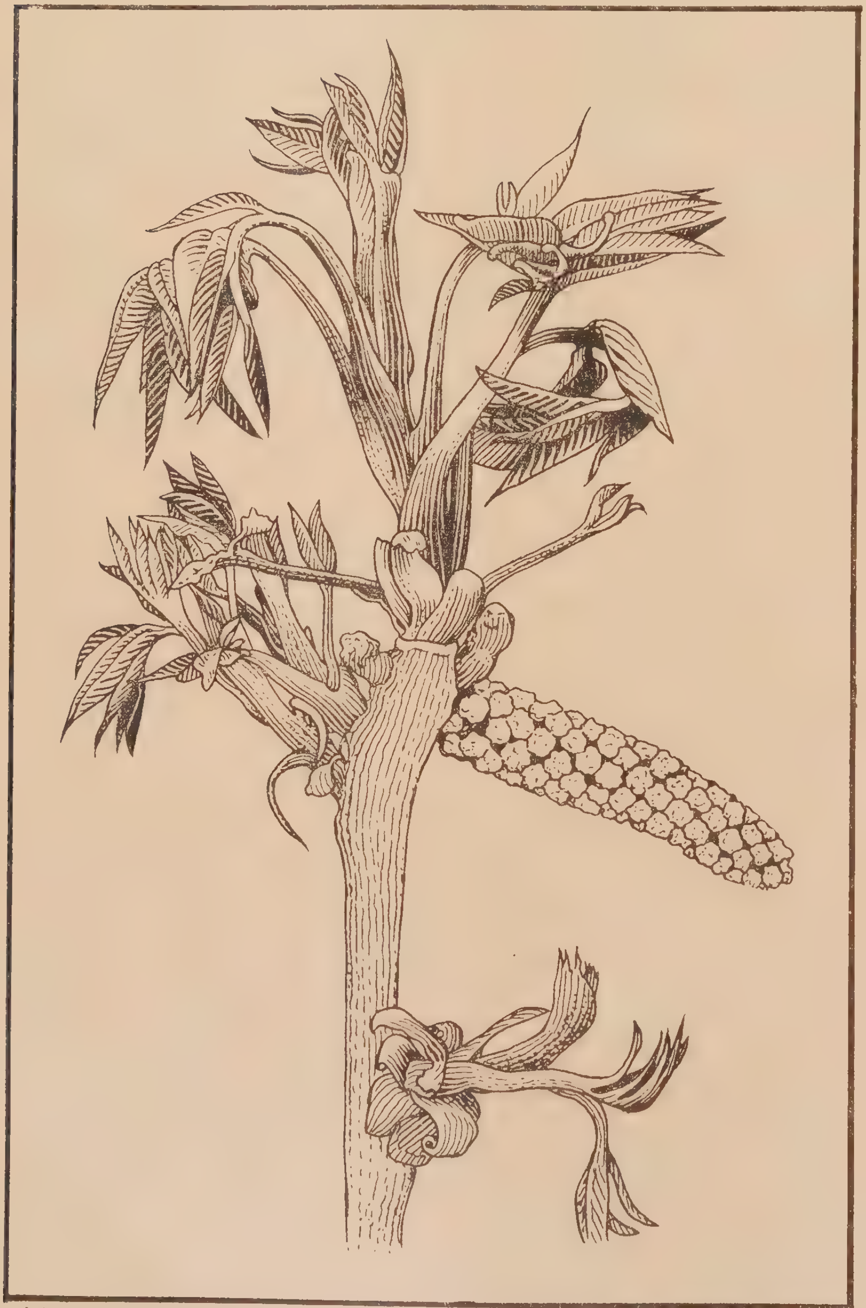
Only One Major Disease

Though several insect pests are known to attack the walnut, including the apple codling moth, the leaf roller caterpillar, and aphides, these pests are of minor importance and normally no control measures are necessary. The one disease of major importance in New Zealand today is walnut blight or bacteriosis caused by a bacterial organism, *Bacterium juglandis.* Undoubtedly it causes a grave loss in production each year, and in some districts the growing of walnuts has been made practically impossible by this disease.

Bacteriosis is essentially a disease of the leaves, catkins, nuts, and new tender shoots of the English walnut, *Juglans regia.* It never kills a tree and rarely causes appreciable defoliation, even in years of heavy infection, and it never attacks the roots. However, the developing nuts are highly susceptible. A fine setting of nuts at the beginning of the season may be gradually attacked until not one remains at harvest time.

The symptoms are usually first noted on the leaves, which show very numerous, small, angular spots dotted over the whole surface, including the veins and stalks. The disease also attacks the tips of the young tender shoots, gradually working back until the older woody growth is reached, when apparently it is arrested, but remains there as a source of infection for a number of years. The catkins and nuts may be attacked at any time after they first appear until the nuts are ready to drop from the husks in the autumn. The period of susceptibility is therefore long. However, blossom infection is the most prevalent, and usually results in the great bulk of infected nuts dropping from the tree. Those that remain on the tree may continue to grow even to full size, but when they are opened up only blackened and shrivelled remnants of kernels will be found.

Later infection after blooming also occurs on the growing nut. In its growing stage the inner shell tissue is very soft, and infection will often penetrate into the developing kernel within, causing a varied type of damage from blackened shells to shrivelled kernels, all of which make the nut either unusable or unsuitable for marketing.



The pre-bloom stage in the development of the new growth when the first spray must be applied for best results in controlling bacteriosis. (Natural size.)

The disease first causes a translucent or water-soaked dot on the leaves, shoots, or young nuts. These dots gradually blacken, and as the disease spreads black irregular patches will form on the nuts when a heavy infection is experienced.

The disease overwinters in cankers formed on infected shoots and in old, infected, rotten nuts that lie on the ground. Some of the sources of infection may be reduced by destroying these old nuts, but that does not prevent the continued spread of the disease from the cankered shoots, and this type of infection can be controlled only by spraying.

Control by Spraying

Considerable experimental spraying for the control of blight has been carried out in America and the results are fairly conclusive. Only one material, Bordeaux mixture, has proved to be effective and the best time of application is the pre-blossom stage—that is, when the buds are bursting and some of the new growth has developed but when few or none of the catkins have appeared. An additional spray later when the nuts are half grown is also an advantage, but a good control of the disease can be obtained by the application of one primary spray.

Varied strengths of Bordeaux mixture have been tried, the most satisfactory being 8:4:50, a spray containing a rather larger percentage of bluestone than is used on other types of trees. Tasmanian apple growers, however, are said to get quite useful control of the disease and a much-increased crop by spraying the walnut tree at the same time as their apples at the green-tip and pink stages and with the same spray mixture.

Because of the large size and spreading habit of many mature walnut trees, spraying may at first appear a formidable task, but modern power sprayers are capable of forcing a jet of spray to the highest branches and the correct time of application is before the tree becomes heavily foliated, thus permitting the spray to penetrate easily and a coverage to be obtained with the minimum quantity. Spraying is practical and economic where modern equipment is available.

It has been estimated that where blight remains uncontrolled about half of the crop is lost in a year of heavy infection. With the shortage in production and the high market value of walnuts in New Zealand today, spraying would seem to be a sound investment, and the cost of one Bordeaux application would be negligible if as a result a full crop of sound nuts could be harvested.

Costing Pig Meat Production

HOW many farmers know what it costs them to produce each porker or baconer or alternatively what are the total production costs chargeable against pig meat per pound of meat produced? The National Pig Industry Council feels that it is important that farmers should study their own costs of production closely, and where they are able to provide any useful information—it may be only on some particular phase of pig production—that they should co-operate by pooling this information for the benefit of the industry. At the request of the council the Department of Agriculture is therefore undertaking a study of pig-production costs on dairy farms and wishes to make contact in the first place with as many farmers and Young Farmers' Clubs as possible who are interested, who have useful information already accumulated, or who would be prepared to co-operate in the keeping of certain records.

VERY few farmers have anything but a very hazy idea of actual costs, but it will be generally agreed that it is worth some trouble to find out what they are and how they are made up. An analysis of costs will enable possibilities of reducing production costs by certain improvements or altered methods or systems to be explored, thus increasing efficiency of pig production.

If a considerable amount of reliable information is obtained, it can be used to set standards for the whole industry with which individual farmers can compare their own production costs and decide by what means these may be reduced. The information when fully analysed will be of great value to those officers who have the responsibility of advising the farmer on his pig husbandry methods.

Detailed Records Required

Those who have ever given the matter much thought will have realised that it is far from easy to be precise about where butterfat costs end and pig production costs begin. Even if an accurate division of costs is obtained, the question of whether the labour reward from pigs is adequate can be decided by the individual farmer himself only by comparison with practicable alternative lines of production. Is there any market for the skim-milk at source? With the already long hours of work, is it worth while putting in that extra effort necessary to improve the piggery (even though this may reduce work in the long run) or otherwise increase pig production?

The decisions taken by individual farmers on these points will depend on circumstances and personal preference, but a clear understanding of the component costs entering into the production of pig meat and other alternative commodities will help the farmer to make the decision appropriate to his circumstances.

To arrive at this understanding of the component costs it is obviously necessary to keep careful record of such things as the man hours employed on pig production as distinct from the main work of butterfat production, working hours of tractor or horse and implement, as well as actual man hours used in the growing, cultivation, and, where necessary, harvesting of crops grown for pigs.

Quantitative records of this sort must be kept in detail, and where farmers already have such quantitative data they would be of great value. Those who would be prepared to keep such records—and Young Farmers' Clubs might find in this a very useful and interesting field for a project to cover, perhaps, two or three seasons—should get in touch with their local District Pig Council or write direct to the Superintendent of the Pig Industry, Department of Agriculture, Box 3004, Wellington C1. The Department will provide a system for keeping the necessary records and will give all possible help in advising on any questions raised or practical difficulties encountered. If such difficulties are reported as soon as encountered, it may be possible for the Department to help overcome them successfully and thus prevent potentially-valuable records being abandoned.

It is anticipated that those co-operating in this cost-of-production survey will include a large number of both butter and cheese suppliers, and within each of these main sections there will be a variety of systems employed. Some will breed all their own requirements and fatten all pigs raised; on either side of this class fall those who concentrate on weaner production and those who purchase all their stock and concentrate purely on fattening. Some will grow considerable quantities of home-grown feed, others will grow no special crops for pigs, and there will be similar variations in the matter of bought feed. Those employing different systems can be grouped in the analysis of the records to give valuable information on the economy of different systems. This information can then be interpreted by the advisory officer and applied to the circumstances on any individual farm.

[*National Publicity Studios photo.*

Every farmer who has even a small amount of information on any item relevant to total production costs chargeable against pig meat per pound of meat produced is asked to assist in the cost of production survey for the benefit of the industry.

COSTING OF PIG MEAT PRODUCTION . . .

How Farmers Can Help

If farmers studying the following questionnaire can supply even a portion of the information required, they are asked to get in touch with the Superintendent of the Pig Industry either through the District Pig Council or direct.

Section A

Have you figures for one or more complete seasons for:—

1. Herd-testing figures for butterfat produced?
2. Total butterfat supplied to factory during season?
3. Total milk supplied to factory for whole season?
4. Total cows milked during season?
5. Details of breeding pigs carried?
6. Details of pigs raised (litters, deaths, etc.)?
7. Details of purchases of weaners, stores, etc., with weight and costs?
8. Details of pigs sold (numbers, weights, values, etc., by classes)?
9. Details of pig food purchased (quantities, cost, etc., by class of food)?
10. Details of pig fodder raised on farm (approximate quantity by kind)?
11. Details of cash costs of raising fodder on farm (quantity and cost of seed, fertiliser, cultivation, harvesting)?

Section B

Have you records available from which you are prepared to supply details regarding any of the following items:—

1. Value of land involved in piggery?
2. Cost of piggery buildings, etc.?
3. Cost of piggery plant and equipment?
4. Quantity and value of labour for pig keeping only?
5. Cost of raising pig fodder (more or less complete)?
6. Other costs in pig keeping (miscellaneous items)?

Section C

Can you furnish fairly complete information about:—

1. General management practices followed?
2. Details of diseases encountered and precautions taken?

Section D

Would you be prepared to keep records on a basis laid down by the Department?

It will be noticed that the records are required to be on a quantitative basis as far as practicable. Costs based on quantitative data enable re-costing to be carried out as required by changes in individual cost items without the necessity of a further survey, but if the quantity of any items is affected by a major change of policy or system a fresh survey would be required.

It is hoped that this outline of the proposed cost-of-production survey will have indicated what can be achieved, with farmer co-operation, for the benefit of the whole industry, and that it will draw a ready response from those who already have some useful information of the type indicated or are prepared to co-operate to obtain it.

Those who offer their co-operation should state what records they already have, whether they are prepared to keep complete records as indicated on a system laid down by the Department, or whether they would offer to keep an accurate check on some particular phase of production—for example, cost of producing crops for pigs. Advice on the system and help to ensure that all points are fully understood will be given.

It is emphasised that the Department cannot do the job properly without the assistance of farmers, and every farmer who has even a small amount of information on any relevant item or would be prepared to help is asked not to let any undue sense of modesty keep him from giving real service to the industry.

Handling Lambs for the Works

[E. Le Johnstone photo.

To avoid blemishes on the dressed carcasses, it is important that lambs on their way to the works should not be lifted or dragged by the wool, poked with sticks, or forcibly crowded through gateways. This draft of lambs off their mothers is being loaded into a lorry by a ramp, up which they are moving quietly. Where transport is direct by lorry, clean dressing at the works is facilitated if lambs are held in clean yards for some hours before being loaded so that they are not full of grass.

SHOW DATES

THE following are dates and venues for A. and P. shows in April.

April 2 and 3—Taranaki Metropolitan A. and P. at New Plymouth.
April 3—Waimate A. and P. at Waimate.
April 10—Methven A. and P. at Methven.
April 10—Poverty Bay A. and P. at Gisborne.
April 24—Flaxbourne A. and P. at Ward.

MACHINE FOR CLEARING LUPINS ON SAND COUNTRY

By **A. J. GALPIN,** *Fields Instructor, Palmerston North.*

ONE of Britain's wartime "secret weapons," the flail tank for detonating land mines, has been ingeniously adapted for the eradication of lupin which has served its purpose in consolidating sand country. The machine has been at work on two properties near Foxton during the past summer. It promises a relatively-cheap and effective method of dealing with lupin, and no doubt could be used on other plants of similar type of growth. Mr. W. P. Clough, blacksmith, of Shannon, built the machine to the design of Mr. W. H. Smith, of Moutoa.

With one stroke the machine reduced a dense stand of lupin to this condition.

THE vigorous yellow tree lupin (*Lupinus arboreus*) has played and no doubt will continue to play a very important part in the holding and stabilising of sand-drifts and sandhills on sandy coastal country, where extensive areas are densely covered with the plant. This lupin has also spread up and down the shingle beds of many of the larger rivers and is to be found far inland where soils are loose, sandy, or stony. There is no doubt about the value of this plant in the control of sand drift, but once the sand is consolidated, particularly on the lower sandhills and the sandy flats, the aim of the farmer is to establish pastures. The lupin then becomes a problem because it is difficult to eradicate. Even where it has been cleared and pastures established the lupin will re-establish as isolated plants and, if neglected in the early stages, will rapidly colonise large areas of grazing land by reseeding, particularly on the lighter and drier sand country.

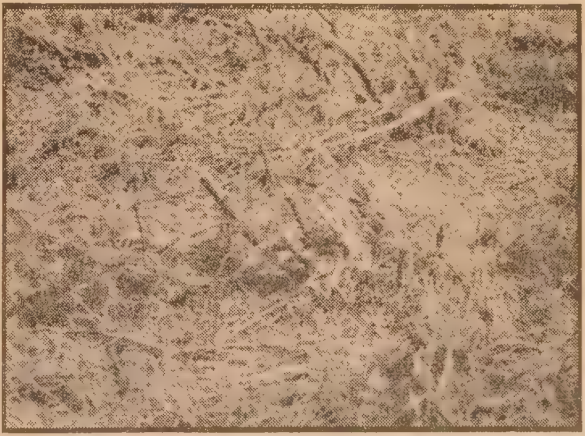
The lupin-clearing machine mounted on a 35-horsepower tractor.

A number of methods have been used to speed up the clearance of lupin-invaded country, the slow, laborious hand cutting and grubbing being succeeded by the use of the heavy tractor roller followed by burning and ploughing, and more recently by the use of the bulldozer blade. The bulldozer is suitable for handling "old man" lupin as a first stage in clearing virgin country, but is too severe on pasture which has been invaded by lupin. The blade tears up the soil, opening the country to the possibility of fresh sand-drifts and blowing.

From observations to date, the machine illustrated would appear to offer a satisfactory solution to the problem of clearing pasture land of lupin before further improvement of the sward by topdressing and oversowing with clovers, particularly subterranean clover, and later better grasses such as perennial ryegrass. The machine is an adaptation of the land-mine detonator used during the war to clear a path through heavily-mined areas. It consists of a stout, hollow, steel drum mounted on a frame in front of a tractor and revolved at high speed by a belt driven from the tractor pulley. Attached to the drum along its full length are four rows of short lengths of heavy chain, each row consisting of 20 lengths each about 8in. long. The drum can be raised and lowered by the tractor driver, and when in working position the chains revolving at some 900 revolutions a minute flail the ground. Plants not cut to pieces are torn off by the whipping action of the flying chains.

The illustrations show the effect of one stroke of the machine on an area of dense, relatively-young lupin 3 to 4ft. high. Under the lupin is still a fairly-good stand of cocksfoot and, as the lupin has been cleared away without disturbing the soil, the cocksfoot will make good growth and an opportunity is provided for further improvement by oversowing with subterranean clover and topdressing.

Observations to date indicate that for a really good kill of the lupin the best time to attack it is in midsummer, when the lupin has reached its maximum growth. Effective work has been done on lupin-infested areas from November to the end of February or after, as the bruised and battered plants make little or no recovery during the hot, dry weather of summer. Land cleared at this time can be oversown with clovers or grasses in the early autumn with every chance of a successful strike.



Plants which are not cut to pieces are torn off by the whipping action of the chains.

FARM WORK FOR APRIL

By the Fields Division.

PASTURES

Young grass: In most districts autumn sowing of pastures should now be completed. In the warmer districts grass can be sown up to the end of April, but earlier sowing is preferable. Especially for later sowing, consolidation is essential for quick establishment of the grasses and clovers and to reduce the risk of erosion by heavy rain or wind. The autumn and winter management of young grass is very important, as the early treatment can easily mean the success or failure of the sowing. The essential points are:—

1. Graze only lightly and allow a spell between grazings.

2. Graze with young stock rather than heavy, mature cattle which will cut up the paddock, especially if the ground is wet.

3. Keep the paddock grazed, but not too hard, right through the winter. Shutting up new grass will smother clovers. Hard grazing will damage young grass seedlings and open the sward for weeds.

Mature Pastures: Paddocks to be closed for early spring grazing should be cleaned out and grazed well down before being shut up. During the summer and early autumn coarse growth which is left by stock is likely to develop in clumps all over the paddocks. If they are not cleaned out before paddocks are closed for the winter, they become larger, clovers are smothered, and the pasture may be badly damaged. The best method of treatment is to graze out hard with dry cattle or sheep. A good harrowing to spread droppings will help to give more even growth in spring.

As winter grazing encourages clover growth and winter spelling encourages grass growth, shut up for spring feed paddocks which contain plenty of clover and keep well grazed any paddock containing much Yorkshire fog or cocksfoot.

Topdressing: For best results from any fertiliser, topdressing should be applied while the grass is still growing; autumn topdressing should be completed by the end of April. Topdressing applied in May, June, or July cannot be used by plants until the weather is warm enough for spring growth to start again, by which time some of the phosphate may be locked up in the soil and some of the other plant food leached out by heavy rain. Autumn topdressing prolongs autumn growth and starts growth earlier in spring.

SUPPLEMENTARY FEEDING

If the weather is cold or dry, keep close watch on pastures and stock during April to ensure that feed does not become too short. Supplementary feed in such form as turnips, chou moellier, or silage, given before grass growth stops, will prevent pastures becoming too short and save extra feeding later when stock are down in condition. Calves should be fed small quantities of good silage or roots with hay, and all stock should be so fed that they start the winter in good condition.

Care is necessary to ensure that autumn litters of pigs do not get a set-back after being weaned. Give litters weaned at this time warm bedding in sties and ample meals of meat meal and milk.

CROPS

Land for autumn-sown cereal crops, wheat, oats, and barley, should be prepared thoroughly, providing a deep, firm seed-bed but with the surface not too fine. Finely-worked seed-beds cake in the winter and prevent the young plants from making proper growth. This condition of the soil is obtained by deep ploughing, which should be completed by the end of April, followed by cultivation with scuffler and tine harrows.

Sow Algerian oats and Cape or Black Skinless barley for greenfeed for early-calving cows. In the higher-rainfall areas Algerian oats are the better crop to sow. Two and a half to three bushels of seed an acre is the usual sowing.

TREES AND SHELTER HEDGES

The best time for planting trees and shelter belts is from April to September, and in the warmer districts where trees are to be established in autumn preparations should be made now. If the shelter belt is composed of trees which are likely to be damaged by stock, erect a double fence to keep stock right away from the trees. A temporary fence about 6ft. from the plants will suffice while the plants are young, but it will have to be moved out as the plants grow. Plough along the line of the hedge as long as possible before planting, and cart out animal manure and work it into the ground.

The value of trees in preventing soil erosion on hill country has been amply proved. Even a few trees to the acre of such varieties as willows, Lombardy poplars, natives, or deciduous English trees, providing they are well protected from stock in the early stages, will reduce the tendency to slipping.

GENERAL

Much farm maintenance work can be done in autumn before winter feeding starts.

Care of Machinery: A most important job which tends to be neglected by many farmers is the housing of implements for the winter. The cost of farm machinery is high and replacements are often difficult to obtain. Any extra time spent in seeing that all harvesting machinery and other implements are properly housed may well save pounds later and avoid delay in the field next year.

Weed Control: Weeds occupy much space in a pasture and give no return, so take the opportunity offered by a slack day to see that weeds are causing as little trouble as possible. Blackberry patches in a paddock or along creek banks take up a lot of good grazing space. If they are scythed down as close to the ground as possible and topdressed, they will probably be kept in control by stock. Grub and burn small patches of gorse and surface sow some seed if necessary. With topdressing, the gorse will also be kept in check by stock.

Fences and Buildings: Repair fences which have become damaged during the season. When feed becomes scarce stock take advantage of broken fences in foraging for food, and the longer repairs are left undone the more difficult they will be. The same applies to broken gates.

A coat of paint applied to the cowshed and other farm buildings while they are still in good condition may save many times the expense later. Shortage of roofing iron and building materials in recent years has made many farmers wish they had taken the trouble to preserve the material in buildings with a coat of paint.

Tracks and Stock Races: Hill-country farmers who have had tracks made with bulldozers are becoming concerned about the amount of scouring out which occurs after heavy rain. If small culverts are made at intervals across the track and a gutter formed with pieces of board or old corrugated iron so that the water is led on to the grass without it falling on to the clay banks at the sides of tracks, much of this scouring can be avoided. Often it is possible to establish grasses on the sides as well as on the track itself; a mixture with a basis of browntop, danthonia, and *Lotus major* should be used, as those species will establish most readily.

Increasing the Weights of Pig Litters

By D. M. SMITH,
Assistant Research Officer,
Animal Research Station, Ruakura.

TWENTY years ago it was demonstrated that the production of litters of pigs averaging 40lb. at weaning was possible under average New Zealand farming conditions. But, despite 20 years of instructional work—for which the farmer has paid for the past 12 years through his pig levies—and a general improvement in pig housing, the picture presented by the figures is not encouraging.

SINCE 1936 1900 pedigree litters have been officially recorded, and the average number in a litter at weaning has been about 7.5. Two-thirds of the litters have failed to reach 90lb. at three weeks and 270lb. at eight weeks; one-third did not even reach 70lb. at three weeks and 210lb. at eight weeks. Those results are for pedigree pigs only and are probably well above the general farm average.

Unfortunately few figures for non-pedigree litters are available, but from the numbers of sows kept and pigs killed it can be calculated that the number of pigs slaughtered per litter is between four and five. Assuming that the average size of a litter born on farms is as low as eight, the mortality rate from birth to slaughter is between 40 and 50 per cent. In addition, the number of sows in production is now the lowest since 1931.

Therefore the industry faces an unpalatable set of facts: Britain is appealing for more pig meat, but the sow population is small, sow efficiency is low, and mortality is high. A year must elapse before the sow population can be raised, but sow efficiency can be increased and mortality lowered immediately by attention to management.

The production of heavy litters involves attention to the care of the sow during pregnancy and at farrowing, the housing and feeding of the sow and litter, and the inherited make-up of the litter. For large litters and heavy pigs produced at the time they are wanted the sow must be fed correctly from the day she weans her previous litter. After weaning she will probably be in relatively-poor condition and, if she is to come in season normally and hold to service, a ration of at least six gallons of milk a day must be fed for the first three weeks after weaning. For the next two months an equivalent of three to four gallons is required to allow a rising condition throughout pregnancy. This ration may take the form of milk, meal, roots, grass, or a combination of them.

Adequate feeding of dry sows is important to ensure rising condition throughout pregnancy. The sows in this good piggery layout are in the right condition.

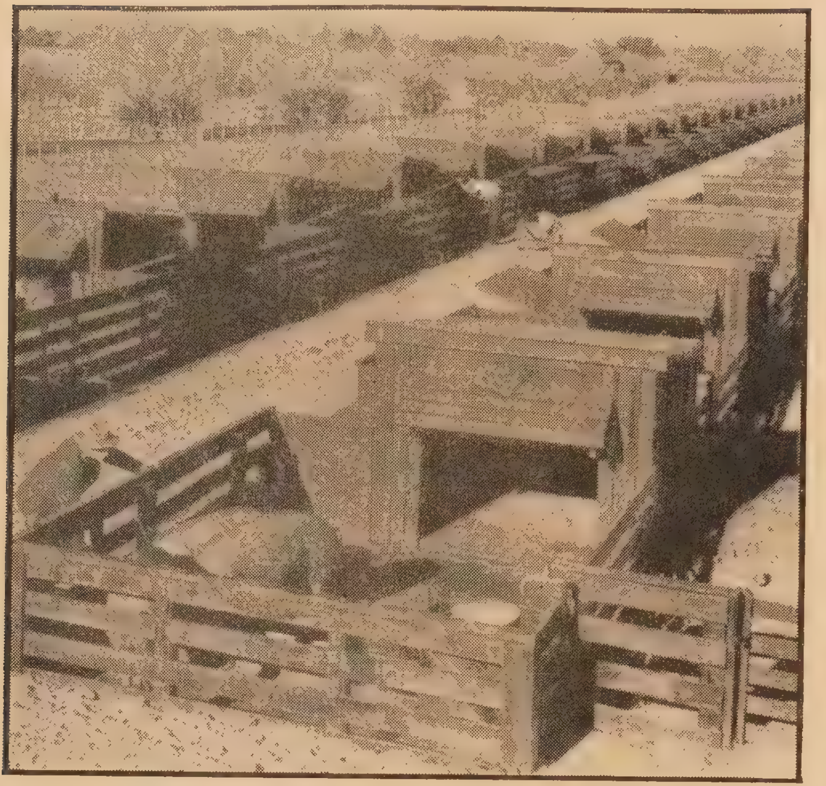
The last three weeks, which should be spent in the house in which she is to farrow, is a most important period. If the sow is in good condition a ration of four gallons of milk a day should be given. Reasonable exercise should be allowed daily and the bowels should be maintained free. The addition of half a pint of molasses or ½lb. of bran when available once or twice a week is helpful. For two days before farrowing the feed should be reduced, and on the due day one or two gallons of milk is the maximum.

Care While Farrowing

Whether a sow should be tended at farrowing is a much-debated question. The argument that a sow which cannot farrow successfully alone is not worth keeping cannot be applied to the pig as a domestic animal. Sows farrow to suit the farmer's convenience or the milk supply; they farrow in houses convenient for feeding and cleaning; the space, rations, and bedding available are all dictated by the owner, so it can hardly be argued that farrowing is a natural process.

The ability of the sow to avoid lying on her young after farrowing is the true criterion of her natural mothering ability. The attendance of the farmer at the time is aimed mainly at reducing mortality through accident. A sow very seldom has an abnormal delivery that will warrant manual aid, but the pain accompanying the birth of the first three or four pigs, especially in the case of a young sow, may cause her to stand up, turn round, or roll from side to side. At that stage she seems quite oblivious of her surroundings, which include the few born first, and it is then that the danger of overlying is greatest. After the birth of the first few pigs the animal will usually lie in one position until the cleanings have been passed. As the first few pigs are usually born quite rapidly, the presence of the farmer for

IMPROVING WEIGHTS OF PIG LITTERS



[*National Publicity Studios photo.*

This type of accommodation meets the requirements of adequate control over the sow and litter at farrowing and ready access to the creep on the side of each house.

this period is not too much to expect if larger litters at weaning are sought.

Housing and Feeding

Modern housing for pigs aims at the provision of a well-ventilated, draught-free house 8ft. by 8ft. with ample head room; a creep for the litter, easy of access, easy to clean, and as close as possible to the house; an enclosed yard adjoining the house at least 6ft. deep in which the sow may be shut when necessary; and a paddock of about one-eighth of an acre, containing shade trees, for grazing when the weather is suitable. House and yard should be well drained; healthy pigs and heavy litters are produced more easily in clean surroundings.

For the first three weeks of life the suckers depend almost solely on their mother for food. The milk the sow secretes will depend on the feed received during the dry period and during suckling and on the inherited milking ability of the sow. The suckling sow's ration should be equal in food value to six gallons of milk a day for her own maintenance and one gallon for each of the suckers. This ration should be built up during the first 10 days, beginning with two gallons on the day after farrowing.

To reach an average of 40lb. at eight weeks the piglets should weigh at least 12lb. at three weeks. A well-fed sow, apart from one with her first litter, that cannot enable her litter to reach that weight is obviously what would be described in the dairy herd as a "waster." The milking ability of a sow is probably inherited in the same way as that of a cow and in its own sphere is just as important. For that reason pedigree breeders have been encouraged to record litters so that the milk production of the dams may be assessed by the three-weeks weight of their stock.

Weight of pigs at birth depends largely on the feed received by the pregnant sow, but the weight of the litter at three weeks depends on the feed received by the suckling sow and her inherited ability to convert that food into milk.

Use of the Creep

The growth rate of the litter from three to eight weeks depends largely on the supplementary feed given the suckers during that period. The rate of growth tends to slacken between the third and fourth weeks. To overcome this check as far as possible it is essential that the suckers be introduced to the creep at 10 days of age or soon after. The aim then is not so much to supplement the sow's milk as to accustom the piglets to the use of the creep area and enable them to develop a taste for the food they find there. As they grow and their appetite increases without a corresponding increase in the milk available from their dam, they will satisfy their growing hunger at their next best and unfailing source of supply—the creep.

Starting suckers on the creep is often a problem. Meat meal scattered lightly on the floor will usually achieve the desired result, but if that does not succeed the addition of a few pieces of tallow about the size of the end of a finger and not exceeding ½oz. a pig daily may help. Suckers appear to relish tallow, and the meat meal sticking to it soon leads to the development of a liking for that too.

Importance of Cleanliness

Meat meal and milk are widely used for creep feeding in New Zealand and, as both sour and ferment rapidly, the troughs must be emptied, cleaned, and refilled with fresh food daily. A covered creep keeps the meat meal dry and avoids waste by fermentation and putrefaction. Any contaminated food will cause digestive upsets in the young pigs, resulting in a slowing up of growth and perhaps death. The food supply in the creep must be unfailing, so that the suckers' appetites are always satisfied without scrambling or gorging as a result of periods of plenty and scarcity.

Breeding of the Litter

Though good feeding and a high standard of care and attention to the sow and litter will enable them to produce to the best of their ability, that ability is limited by heredity. Even with adequate food the sow can milk and the suckers grow only as fast as they are genetically capable. Therefore, the breeding of the dams and sires must always be taken into account.

The belief, only too prevalent, that when two breeds are crossed the breed and not the strain of the sire is important is probably in a large measure responsible for low sow efficiency and low average weaning weights. Even in pedigree breeding the importance of the inheritance of growth rate is too often overlooked; it is certainly far too seldom measured. Whether the litter be pure-bred or cross-bred, it is only as good as its inheritance from its sire and dam.

Making the Best Use of Available Poultry Feed

By F. C. BOBBY, *Superintendent of Poultry Husbandry, Wellington.*

THE difficulties associated with maintaining supplies of poultry feed during 1948 are referred to in a statement to poultry producers by the Minister of Agriculture on this page. All possible has been done to assist the poultry industry, and this article sets out some ways in which poultry producers can help both themselves and the industry during any difficult period which may arise during 1948.

The short beak, prominent eye, and general alertness of this head denote a good laying bird. The head is well proportioned and strong and suggests strength of constitution.

THE general preference of poultry producers for wheat as a grain feed is based on a cost factor and on wheat's presumed greater feeding value than either barley or oats. Some poultrymen have developed a liking for feeding soaked wheat to the exclusion of the use of mash, but producers should now face the fact that such preferences must be shelved until the wheat supply position improves. The hard fact is that insufficient wheat is available this year for poultry producers to give wheat alone in their grain feed, and every endeavour should be made to obtain oats and barley to eke out supplies of wheat. No purpose would be served by suggesting definite proportions for a mixture of these grains, as supplies of each will vary from time to time.

Barley is an excellent feed for poultry and may be used without fear of adverse effects on laying or the health of the birds. Good plump oats are also a good poultry feed, but the feeding value falls off sharply in light samples and where there is more fibre and less kernel. Here is a comparison of the food composition of average samples of these grains:—

	Protein	Oil	Carbohydrates	Fibre
	per cent.	per cent.	per cent.	per cent.
Wheat	12	2	69	2
Barley	9	2	68	5
Oats	10	5	58	10

Barley compares well with wheat, but oats have not the same feeding value as the other two grains. Nevertheless, oats must play a prominent part in the feeding of flocks until the food position improves.

Though during the past 12 months poultry producers have been requested not to resort solely to soaked wheat feeding, some have persisted in doing so. To continue that practice and to endeavour to obtain sufficient wheat at all costs to carry it out is a selfish policy which must reduce supplies of wheat to other poultry producers and so adversely affect their livelihoods.

Though it is not expected that many producers will attempt autumn hatching in present circumstances, the raising of pullets at this season of the year is tantamount to increasing a flock. Therefore poultry farmers should not autumn hatch this year.

Importance of Culling

Continuous culling of all classes of poultry stock is fundamental to successful management, but far too little culling is practised on the average poultry farm. Few if any producers will permit wastage of food either in the food store or at feeding time, but too many fail to realise that valuable food is being wasted daily when it is given to sick birds and those whose

The head of a good laying bird, showing prominent eyes and general alertness. The comb falls gracefully without obscuring the bird's vision.

THE POULTRY FOOD POSITION FOR 1948

OWING to the world shortage of wheat and coarse grains, the method of allocation of export cereal surpluses through the International Emergency Food Council, shipping difficulties, and the small New Zealand cereal area this season, the supply of grain for poultry feeding may present certain difficulties during 1948. The Government is doing everything possible to secure adequate supplies from Australia, and it now appears that sufficient non-millable wheat may be secured to maintain the poultry industry properly. Until such supplies have been transported and stocks are available here there is a possibility that there may be some insecurity in supply, and in the meantime the fullest use should be made of the supplies of coarse grains available.

It is obvious that with the difficulties which may occur in providing feed, this is no time for any poultry farmer to increase the size of his flock or for new producers to enter the industry. In fact until the position becomes clearer producers should be more than usually severe in their normal seasonal culling operations and only really good breeding hens and pullets should be retained in flocks.

EDWARD CULLEN,
Minister of Agriculture.

MAKING BEST USE OF POULTRY FEED . . .

production is too low to show a reasonable return in eggs. Severe, efficient culling is of prime importance at present and may well be an important factor in preventing any need for reducing flocks by selling off sound, producing birds. To reduce a flock by drastic culling and feed the remainder with a full ration of grain and mash is far sounder policy than to retain a greater number of birds and give them reduced quantities of food.

Consider the following programme:—

Hens: As good laying pullets are the heaviest layers on the farm, they are the last birds to be sacrificed (with the exception of a nucleus of good breeders) should an acute shortage of food occur. Accordingly breeding stock should be selected—well up to the standard required under the Poultry Flock Improvement Plan—and all remaining hens discarded immediately they go out of production or earlier if the food situation enforces a reduction in stock.

Pullets: Inspect the pullets and discard any which show signs of weak constitution or undue coarseness. All weak-headed and undersized birds should go; they rarely show a profit in normal times and today they are wasting food. If rearing has been normal and the flock has received no serious setback, pullets which fail to come into production at the proper time should be treated with suspicion and culled unless they show early signs of coming into production.

Male birds: Though greater numbers of cockerels than will be wanted ultimately for the breeding pens must be retained to afford a reasonable selection when pens are made up, continuous and drastic culling of these birds is essential. When a cockerel exhibits some fault, including weakness of constitution, that bird should be on its way to the butcher as soon as practicable.

Continual culling on a daily basis throughout the farm calls for both persistence and patience and means making a special effort, but at no time has it been more important to cull birds effectively.

The "Backyarder"

Those who have only small units of birds can do much to help themselves and the general food situation by using household scraps to the fullest extent. Good household scraps, including meat, bread crusts, potatoes, and surplus cooked vegetables, may form at least 25 to 30 per cent. of the daily wet mash. A suitable receptacle should be put in a convenient place and these scraps collected.

If the majority of "backyarders" conscientiously used scraps, the demand for standard poultry mash would be reduced appreciably. That in turn would conserve grains which are now in short supply.

It is too early to predict how the feed position will affect the breeding programme for 1948. Much will depend on present negotiations with Australia and on the availability of transport both by rail in Australia and by ship to New Zealand.

Minimum Rates of Wages Payable to Agricultural Workers

THE minimum rates of wages payable to workers employed on dairy farms, agricultural and pastoral workers, tobacco workers in the Nelson industrial district, and workers employed in orchards are set out below. Copies of the orders governing these rates of wages, which are administered by the Department of Labour, are obtainable from the Government Printer, Wellington.

Workers Employed on Dairy Farms

	Per week £ s. d.
Under 17 years	2 5 6
Of the age of 17 years but under 18	2 17 6
Of the age of 18 years but under 19	3 10 0
Of the age of 19 years but under 20	4 2 6
Of the age of 20 years but under 21	4 14 6
Of the age of 21 years and upward	5 6 6

The above rates apply as from November 1, 1946. For workers not provided with board and lodging by their employers provision was made for the above rates to be increased by £1 per week until July 31, 1947, after which date they were to be increased by £1 5s. per week.

Agricultural and Pastoral Workers

Agricultural and pastoral workers are defined as workers employed on farms and stations used for the commercial production of wool, meat, or grain (including seed) whether exclusively or together with any other purpose, other than those workers so employed who are covered by an award or industrial agreement under the Industrial Conciliation and Arbitration Act, 1925, and its amendments.

	Per week £ s. d.
Under 17 years	1 18 0
Of the age of 17 years but under 18	2 9 0
Of the age of 18 years but under 19	3 1 0
Of the age of 19 years but under 20	3 12 0
Of the age of 20 years but under 21	4 3 6
21 years and upward	4 15 0

Casual Workers

	By the hour		By the day	
	Found	Not found	Found	Not found
	s. d.	s. d.	£ s. d.	£ s. d.
Harvesters ..	3 1½ an hour with rations			
Other workers	2 7½	3 1½	1 1 0	1 5 0
Youths up to 18 years ..	1 9	2 3	14 0	18 0

The above rates apply as from November 1, 1947.

Where board and lodging are not provided by an employer for workers other than casual workers the rates are to be increased by £1 5s. per week. Where a worker is provided with only lodging or a free house the wages are to be increased by £1 per week.

Provisions as to holidays and conditions of employment are contained in the Agricultural Workers (Farms and Stations) Extension Order, 1947 (Serial No. 1947/207).

Tobacco Workers

The order applies to workers employed in the tobacco industry in the Nelson industrial district.

Males

	Per hour s. d.
Adults	3 1½
Under 16 years of age	1 3
16 and 17 years of age	2 0
18 years of age	2 7
19 and 20 years of age	2 9
Thereafter	3 1½

Females

Under 16 years of age	1 1½
16 and 17 years of age	1 8
18 and 19 years of age	1 10
20 years of age and over ..	2 0

These rates apply from November 1, 1947.

Provisions with regard to overtime, holidays, and conditions of employment are contained in the Agricultural Workers (Tobacco-Growers) Extension Order (No. 2), 1947 (Serial No. 1947/206).

Workers Employed in Orchards

	Per week £ s. d.
Managers	7 0 0
Other male workers of 21 years or over	6 7 6
Female workers	4 2 0

Youths

Over 15 to 16 years	1 18 6
Over 16 to 17 years	2 3 6
Over 17 to 18 years	2 14 0
Over 18 to 19 years	3 7 0
Over 19 to 20 years	3 17 6
Over 20 to 21 years	4 17 6

These rates apply from November 17, 1947.

The foreman or leading hand doing grading or packing work is to be paid 3d. per hour in excess of the ordinary rate. Any other worker taking control of grading or packing operations is also to be paid 3d. per hour in addition to his or her ordinary rate.

Provisions with regard to hours of work, overtime, holidays, accommodation, and general conditions of employment are contained in the Agricultural Workers (Orchardists) Extension Order (No. 2), 1947 (Serial No. 1947/208).

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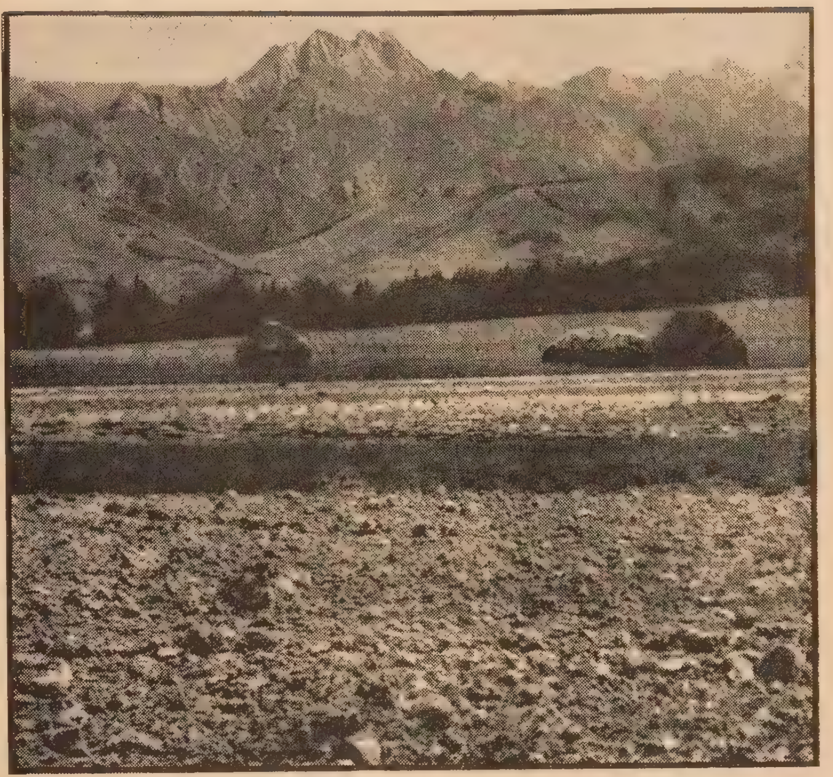
Subterranean Clover in Canterbury Pastures

By E. G. SMITH,
Fields Instructor, Rangiora.

THOUGH subterranean clover has been grown in Canterbury for some 20 years, it was not widely used until about 10 years ago. Since then it has proved a useful pasture plant on much light to medium land and has played an important part in raising fertility on such country. The sowing of subterranean clover is strongly recommended where fertility is so low that white clover will not thrive. On such land good stands of the clover increase stock-carrying capacity and thereby build soil fertility to a state where white clover can profitably be included in the pasture mixture.



On light shingle country, whether in Auckland, Canterbury, or Otago, subterranean is usually the best clover to sow.

IN the early years of its popularity subterranean clover was sown on soil types varying from light sheep country, where it filled a useful place, to heavy dairying land, where white clover would have been much more productive. Today farmers have a better knowledge of the plant and it is used almost exclusively on light to medium land.

Mount Barker, the mid-season strain, is most widely used in Canterbury, but though it makes earlier spring growth than Tallarook, the latter has certain advantages. Tallarook has dense growth which gives a better ground cover and provides grazing later in the season than does Mount Barker. It is also a heavier seeder and is therefore more likely to persist under hard grazing. The failure of the Tallarook strain to make early spring growth limits its use as a pure stand, but if the two strains are sown in the same mixture the productive period of the area is lengthened. The early-flowering type, Dwalganup, is an open-growing and low-producing strain which has no useful place in New Zealand.

Mount Barker subterranean clover which has dried off and reseeded.

Dependence on Reseeding

Subterranean clover is an annual and therefore depends on reseeding for its existence. If it is sown in the spring, the plants flower during the autumn and die before the seed is mature. The natural time of seeding is in early autumn and for most reliable results the seed should be sown then.

Sown on medium land in association with white and Montgomery red clovers, subterranean clover provides early spring grazing and the other species produce feed later in the season. The clover is usually sown in a mixture with perennial ryegrass, though the ryegrass frequently dies out after two or three years. If a mixture of 6 to 8lb. of cocksfoot is sown with 3lb. of subterranean clover and 2lb. of white clover, a well-balanced pasture results. Both cocksfoot and subterranean clover require lenient grazing in the first year but once established will persist under normal grazing. An added advantage of this mixture is that both cocksfoot and subterranean clover withstand an invasion of grass-grub to a marked degree. Cocksfoot is seldom damaged by either grass-grub or porina, and after being attacked subterranean clover re-establishes rapidly because of the supply of seed in the ground from previous reseeding. If nursed during the autumn, the cocksfoot-subterranean clover paddock gives useful grazing during the winter and spring.

The clover may be sown either on a prepared seed-bed or on existing pasture. Broadcasting on well-prepared land is satisfactory under ideal conditions, but drilling usually gives more reliable results and, given a good reseeding in the first season, the spaces between the drills are filled in. A well-prepared seed-bed facilitates a uniformly-shallow placing of the seed.

There is no doubt that the most satisfactory method of establishment is to sow the pasture mixture in early autumn after a summer fallow. That permits the clover plants to obtain a good root hold

In recent years subterranean clover has played an important part in pasture improvement on the Canterbury Plains.

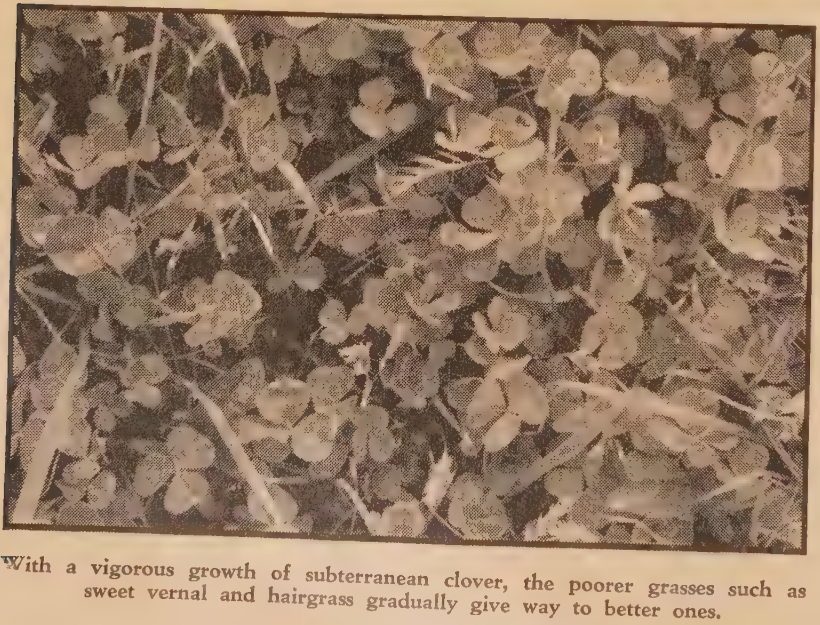
before the winter and make rapid growth in early spring.

Sowing with Other Crops

A practice which has the merit of cheapness is the sowing of subterranean clover with Algerian oats in February. If the oat crop is not sufficiently heavy to smother the young clover plants, that method can be quite satisfactory. When the clover has established the area may be used for greenfeed, and when the paddock is closed for chaff or a grain crop the clover plants will flower and set seed.

Sowing with such crops as rape or turnips in October or November is not usually satisfactory, as the subterranean clover plants flower during the late autumn and seed does not mature. However, if the seed is not sown until December, flowering will not usually take place until the following season and seed development will therefore occur at the normal time. Rapid establishment is desirable, so seed should not be sown after mid-March.

The introduction of subterranean clover to existing pasture is rather a slow process, and until establishment is satisfactory only light grazing is desirable. Trials are being carried out by the Department of Agriculture in an endeavour to provide reliable information about the broadcasting of clovers on hill country. Results are not yet conclusive, but indications are that subterranean clover is likely to play an important part in increasing stock-carrying capacity on much low hill country.

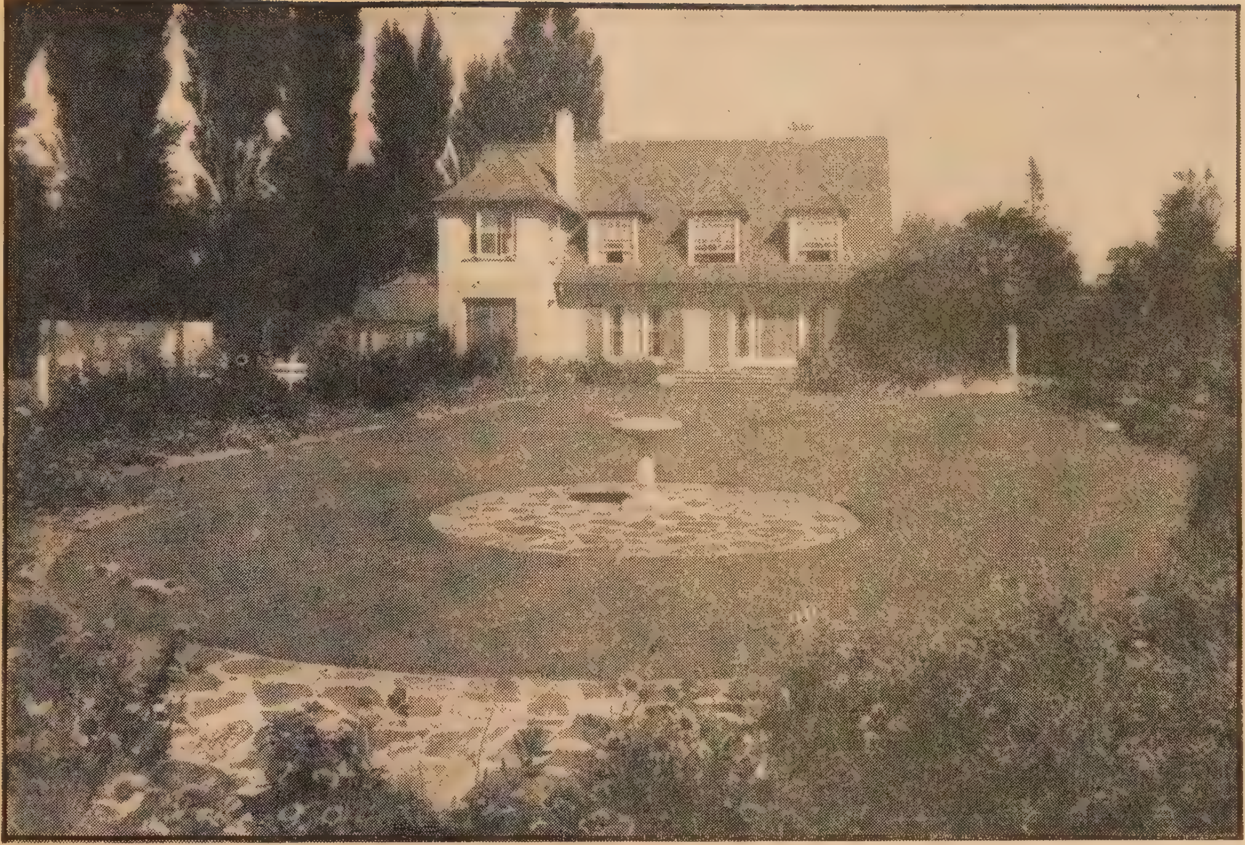


With a vigorous growth of subterranean clover, the poorer grasses such as sweet vernal and hairgrass gradually give way to better ones.

Whatever the method of sowing, the aim in the first year should be to permit reseeding. Heavy stocking in late spring or during the summer is likely to result in a poor pasture. If the stand is nursed during that period, the clover plants will send out many runners, thus ensuring a good reseeding. In subsequent years no special care is necessary, for even under hard grazing the plants will form seed close to the crowns.

To obtain anything like the best production topdressing with a phosphatic fertiliser is essential, and on the majority of Canterbury properties the judicious use of lime will be profitable. Where possible superphosphate or serpentine superphosphate at the rate of 1cwt. an acre should be applied during the autumn.

Subterranean clover pastures which have received suitable topdressing will produce well for many years, but on light land ryegrass will disappear. The paddock may then be hustled during early autumn and sown with one bushel of Algerian oats and one bushel of perennial ryegrass. Land treated in that way gives valuable greenfeed during the winter and spring, and the rejuvenated pasture provides good grazing for a number of years.



Establishment and Maintenance of a Lawn

By **F. SYDENHAM,** *formerly Assistant Horticulturist, Wellington.*

A GOOD lawn, which is the ambition of most home gardeners, is not difficult to obtain, but cannot be produced by haphazard methods. Lawncraft is a science in which various species of grass are brought together as an association in a most unnatural environment. To maintain them in pleasing condition, rather rigid adherence to certain fundamental principles is necessary.

WHEN planning to lay down a lawn, the most suitable time for sowing the seed should be the first consideration. Attempts to sow at any but the best season for the district may result in failure. It is the practice in the North Island, and in parts of the South Island where summer droughts are experienced, to sow lawn seed in the autumn. In the North Island sowings made during the second and third weeks of March allow sufficient time after the onset of autumn rains for the plants to become firmly established before winter. In the South Island the seeding should take place three weeks earlier. Spring sowings can be recommended only in districts with particularly severe winters and where there is no summer drought.

Preparation of the Ground

Ground to be sown with lawn grasses should be well cultivated and free of weeds. The customary method of obtaining this desirable condition has been by the growing of potatoes, a crop which requires frequent cultivation and leaves the soil loose. The growing of main-crop potatoes before sowing a lawn is not a good practice, as it does not allow the consolidation of the lower levels of the soil which is desirable when grass seed is sown. Bare fallowing after deep digging in late spring, followed by frequent surface hoeing, allows the soil to be brought into the most suitable condition for sowing—a firm base and loose surface. At least two months should elapse between deep working and seed sowing. Early potatoes would satisfy that requirement; the main-crop varieties do not.

Where potatoes are grown the soil in the rows will be cultivated to a fair depth when they are lifted. The soil between the rows should receive the same treatment in order that it should all be in as similar condition as possible. It may be wise to use the fork in this working, bringing the larger clods to the surface, where they can be broken in subsequent cultivation.

There should be no further deep cultivation, but plenty of surface working to destroy weeds and prepare a fine seed-bed. While the soil is dry it should be walked on as much as possible to consolidate it. If the soil is walked on when wet and sticks to the boots, the consolidation may be so great as to be harmful.

During the period of cultivation the surface should be brought to its final level. Soft patches or places where fillings have been made must be tramped thoroughly; that is a laborious way of doing the work, but there is no implement that can compare with the heel for this task. After the fillings have been firmed the surface layer should again be loosened, as is recommended for the whole lawn. The depth of the surface cultivation should be reduced as the final level is approached, and for the last few weeks should not exceed 1in.

Photograph used in heading by Green and Hahn Ltd.

A rake is useful for the preparation of the surface and for levelling, but not everyone can make a level surface with a rake. The use of a straightedge, a piece of board 4ft. long, to smooth the surface more or less as a plasterer would smooth cement is recommended.

The final preparation should take place after there has been rain and after allowing sufficient time for the soil to come into condition. The ideal depth for this cultivation is ½in. After being smoothed with the board the lawn is ready for seed and manure.

Sowing

Manure and seed should be sown at the same time but in separate dressings. A suitable fertiliser for most conditions consists of equal parts of sulphate of ammonia and superphosphate at the rate of 1oz. to the square yard, with ¼oz. of sulphate of potash where the soil is sandy or peaty.

The most suitable seeds mixture is one containing two parts of New Zealand chewings fescue and one part of Government Certified browntop, sown at the rate of not less than 1oz. to the square yard. Both grasses are fine leaved and produce a dense turf under widely-varying conditions.

Seed sowing and manure distribution are not difficult. Uniformity is essential and is best obtained by dividing the seed into, say, four equal lots and attempting to cover the lawn evenly with each but from a different direction. It is not so essential to spread the manure evenly, though care should be taken to spread it as evenly as possible.

With the seed and the manure sown, a rake may be used to stir the surface lightly and cover most of the seed. The ground should not be rolled or walked on more than necessary at this stage.

Birds may appear to take seed, but the amounts they eat, especially when the seed is small, are probably insignificant. However, they cause trouble by using the tilth as a dust bath, and it is worth while trying to keep them off a newly-sown lawn with strands of black cotton strung over the surface on sticks, or some other device.

Attention After Sowing

Once the lawn has been sown it should not be walked on until the grass is firmly established.

When the grass appears it should be green. If it later turns a sickly yellow because the seedling roots are failing and the permanent roots are being developed, a dressing of sulphate of ammonia, at ½oz. to the square yard, should be given. It will probably be necessary to repeat the dressing later if the grass goes yellow again. On small areas the sulphate of ammonia can be applied conveniently through a watering can, using 1oz. of the chemical dissolved in 2 gallons of water on 2 square yards of surface.

The first and critical winter over, the area should begin to look like a lawn. It will require mowing, which is best done with the roller of the mower set as low as possible so that the blades are high. Mowing should not be overdone in the early stages and until the grass has developed a strong rooting system. The grass should be tipped as it reaches a height of 1½ to 2in. so that light is admitted to the basal portions of the plants.

Rolling, Mowing, and Watering

The roller is an implement which need be used little if at all on a lawn. It should never be used to squeeze down lumps, as that leads to uneven consolidation and poor growth of grass in the tight spots. Worm casts should be "switched" with a flexible stick. If the roller is used, the soil should be dry enough not to adhere to it. Rolling does not take the place of topdressing with soil to obtain an even surface.

A lawn should be mown regularly, and at least once a week during the season of rapid growth. Frequent mowing is advisable, but the blade must not be set too low. During the winter and early spring occasional tipping is needed in many districts, and at this season, as with young grass, the blade of the mower should be set high. During the summer the clippings are sometimes left to fall on the lawn to serve as a mulch, but at other seasons it is advisable to collect them and use them as a valuable addition to the compost heap.

Water, when thought necessary, should be given generously and the ground thoroughly soaked. At least 2 gallons but preferably 3 or 4 gallons to the square yard should be applied, as just moistening the surface of the lawn does more harm than good. The rate of application should be such that the water soaks into the ground as it is applied; that is especially important on sloping ground, where water runs off and scours if applied too rapidly.

Manure Mixtures

A good sward of fine grasses free from weeds and clovers can be maintained effectively only if the lawn is properly manured, as a good lawn is an unnatural association of plants which will soon deteriorate if starved. Lawn manurial programmes are designed to feed the grasses and to maintain an acid condition in the soil which is detrimental to the development of certain weeds and clovers and tends to discourage worms.

It is recommended that the whole lawn should be dressed every three months (in March, June, September, and December) with 1oz. to the square yard of one of the following mixtures:—

Lawns containing clover

6 parts of sulphate of ammonia
*4 parts of superphosphate
2 parts of sulphate of iron

Lawns where clover does not develop

6 parts of sulphate of ammonia
*4 parts of superphosphate
†2 parts of dried blood

*After the first year this should be reduced to 2 parts of superphosphate, as too heavy a dressing tends to induce weeds, clover, and fungus diseases.

†Dried blood encourages worms and induces fungus diseases unless used with discretion.

The manure should be distributed evenly, preferably by mixing it with its own bulk of dry soil or sand, dividing the bulk into two parts, and going over the lawn twice in different directions.

Manuring serves the double purpose of improving the lawn and producing a greater quantity of grass mowings, which are a valuable contribution to the humus supply of the garden. Mowings may be applied directly to the soil or used in the compost heap to assist harder, more woody material to rot down.

Topdressing and Spiking

Topdressing with sifted soil is the most useful method of maintaining the level of a lawn. By that means small irregularities may be smoothed out.

It is sometimes recommended that soil used for topdressing should be sterilised to kill weed seeds, but the presence of weed seeds does not matter if the lawn is correctly manured and managed. Alternatively, sand can be used if a rather harder surface is desired; a dressing of sifted compost has the opposite effect.

As far as possible, soil used for topdressing should be similar in type and character to that of which the lawn itself is composed to avoid dangerous stratification of the soil, as an uneven soil texture affects grass growth.

If only a thin layer of soil is to be applied, it is best used dry when the lawn is dry and after mowing. Under those conditions a thin layer may be spread with a straight edge and a minimum of topdressing left except where it remains to bring shallow depressions up to the level of the lawn, the board ensuring an even surface.

Where there are considerable irregularities and the depth of topdressing required would smother the grass in the depressions, one of three methods is advisable: Fill the depressions gradually, allowing the grasses to grow strongly through the dressing before another is applied; sow seed on the parts where the filling is made; or lift portions of the turf where the depressions are most marked, add a layer of soil underneath, and replace the turf so that the surface is levelled. By the first and last methods the composition of the turf is maintained and the lawn does not appear patchy, as could occur when seed is sown. The turf may be raised in autumn, winter, or early spring.

Spiking—perforating the turf at regular intervals with a sharp instrument—has a beneficial effect on lawns which receive heavy wear and become over-consolidated. Small lawns may be treated with a garden fork, but on large areas some form of spiking machine may be used. The operation should be carried out in the autumn or early winter, when increased aeration and improved drainage will have the most marked effects. The aim is to perforate the turf at 2 or 3in. intervals by driving the fork vertically into the soil and withdrawing it without levering it sideways, which would tear the turf.

Moss and Weeds

Moss is usually a sign of neglect or of liming or other incorrect treatment of a lawn. If grass is present, moss can be controlled by the manuring programme described, and the lawn should soon develop into one of good condition. It may be advisable to rake the lawn, which will lift much of the moss, to be removed later by mowing. Any gaps in the turf may then be filled by topdressing with soil and seed in the autumn.

Weeds are least troublesome in a lawn of healthy, strong-growing grasses. The manuring recommended aims at producing a degree of acidity in the soil that is tolerated by the grasses but is unfavourable to the development of clovers and weeds, so that they decline and ultimately disappear. The lawn should be kept free from weeds mainly through good management and manuring, though special steps may have to be taken to rid an infected lawn of weeds in the first place.

The return of lawn clippings containing the seeds of such weeds as annual poa grass (*Poa annua*) would probably lead to its increase, which is not desirable, as this is a relatively coarse grass not resistant to wear.

Weeds may appear to dominate a newly-sown lawn. In many instances the small seedling weeds are destroyed by the first mowing, for they do not branch from ground level as do the grasses.

[*Photo News Ltd. photo.*

Photograph taken two weeks after applying weedkilling hormone to a lawn badly infested with plantain, catsear, and white clover. Plantain leaves are extremely distorted and all the weeds died within a month of spraying.

Chemical Control of Weeds

The reduction of weeds in established lawns is a subject demanding more detail. Many lawns heavily infested with weeds can be brought back to a good sole of grass by a rather drastic use of chemicals, but that should be attempted only if the lawns contain a large proportion of evenly-distributed grasses of a type which would make a good lawn if present as a sward. If the grass is not plentiful or suitable, it is preferable to dig the area and cultivate the surface for at least three or four months to destroy perennial and seedling weeds before resowing it.

The following chemical methods of weed control can be expected to produce a good lawn where there is a high proportion of good grasses evenly distributed:—

Sulphate of ammonia and sulphate of iron

Though sulphate of ammonia in itself is a weedkiller, and its continuous use in small quantities will deter many weeds, the addition of one-third of its weight of sulphate of iron assists its action on weeds and at the same time improves the colour of the grass. Those chemicals in those proportions are the effective ingredients in most lawn sands, and they assist in the general nutrition of the lawn as well as reducing weeds.

This combination of chemicals will kill most of the serious weeds in the lawn. The mixture should be used at the rate of 1oz. a square yard, evenly distributed early in the morning when dew is on the grass and when there are prospects of fine weather for the ensuing 24 hours. A little dry soil, or preferably sand, may be mixed with the chemicals as a filler to facilitate even distribution, but large quantities of fillers do not always give satisfactory results. The bulk of filler should not exceed the bulk of the mixed chemicals.

Application of the mixture may cause temporary burning of the lawn, especially if dry, hot weather follows. When that happens no further application should be made until the grass is quite green again, even though the weeds may have started to grow again in the meantime. Six or eight applications at intervals of 8 to 14 days may be needed to clean up a weedy lawn.

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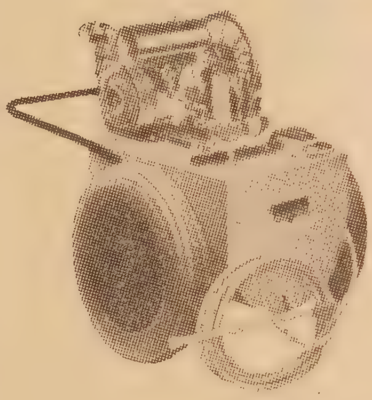

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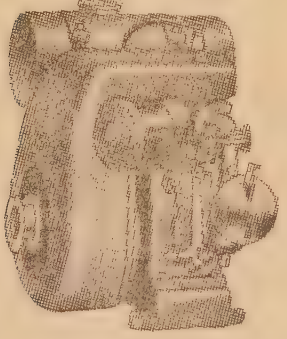

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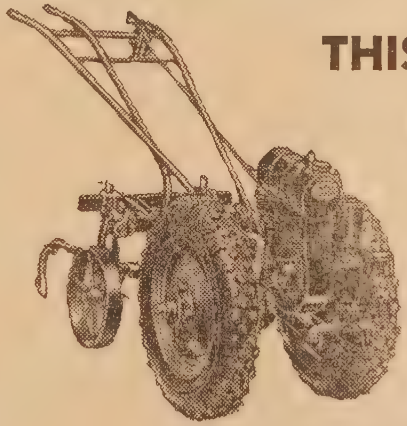

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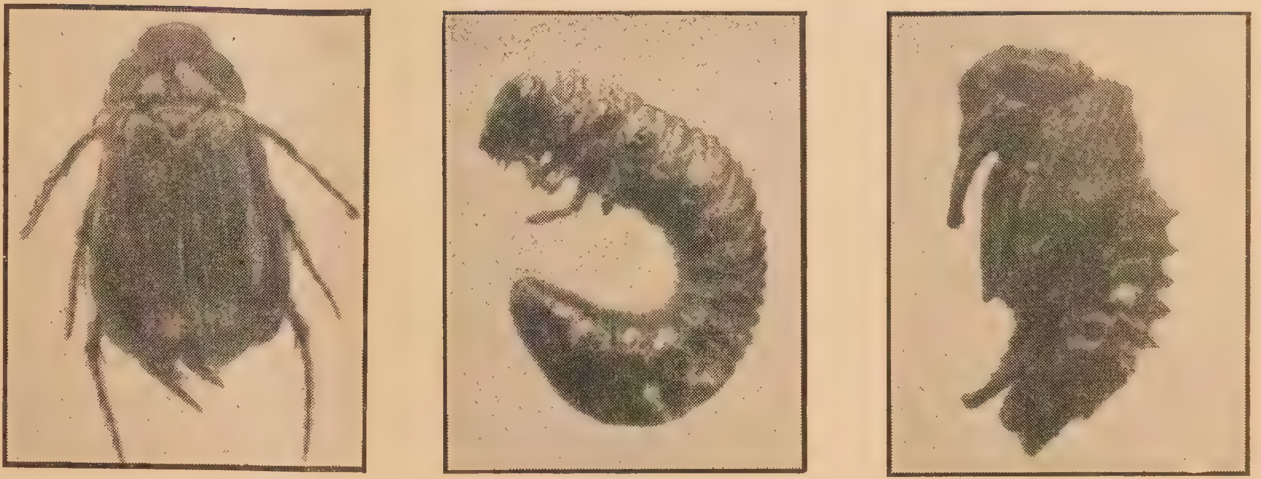
THE GRASS-GRUB


Left—The adult insect, a small, brown, hard-backed beetle which flies at dusk in late October, November, and early December. Middle—The injurious stage. The small white grub is curled into a horseshoe shape. Right—The resting or chrysalis stage is white and may be found in a cell in the ground during October and November.

For more effect on large rosette weeds a pinch of the mixture should be placed on the crown.

Weeds which are relatively resistant to the mixture are pearlwort (*Sagina procumbens*), chickweed (*Cerastium glomeratum*), *Onehunga weed* (*Soliva sessilis*), and pennyroyal (*Mentha pulegium*)

Catsear (*Hypochoeris radicata*), dandelion (*Taraxacum officinale*), daisy (*Bellis perennis*), plantains (*Plantago* spp.), and clovers can be completely eradicated by systematic use of the weedkillers.

Arsenic pentoxide

Arsenic pentoxide may not be available in New Zealand at present. This chemical kills plants by contact. Experiments have shown that relatively-weak concentrations, applied as a fine spray, will kill weeds and *Poa annua*, whereas the desirable grasses, though browned for possibly three weeks, recover if conditions are suitable for growth. It is inexpensive and easy to use, but is highly poisonous to people and animals. Care should be taken that it does not touch the skin, as it may be absorbed, causing skin infection and softening and loss of finger nails.

Arsenic pentoxide should be sprayed during periods of vigorous growth, preferably during the autumn. The lawn should be mown before treatment and the spray applied when the grass is dry and when there are prospects of fine weather for 24 hours. A fine spray should be used and the herbage thoroughly wetted, but not to the extent that there is a large run-off of spray liquid from the leaves; that is important, as too heavy an application or spilling of the liquid on the lawn will probably result in the death not only of the weeds but of the grasses. At the concentration detailed 240 gallons of the spray should be used in treating an acre, or 5½ gallons for 1000 square feet.

To ensure an even application it is wise to divide the lawn into areas, using the garden line or binder twine, and apply to each portion the appropriate volume of spray.

When the work is completed, pump, containers, and the hands should be carefully washed in clean water.

Most of the weeds should be dead after a week. The lawn should then be raked vigorously to loosen the surface soil and assist the grasses in their development. Fresh lawn seed may be sown a fortnight later, if required, and to ensure minimum competition from the existing grasses the lawn should be kept short so that light penetrates to the young seedlings.

Arsenic pentoxide should be used under various circumstances in the following concentrations:—

1:100 to 1:200 (1lb. in 10 to 20 gallons of water) if the soil is dry and the grasses are not strong, or if the weeds consist mainly of young seedlings in a newly-established lawn.

1:80 (1lb. in 8 gallons of water) under average conditions where the grasses are strong and the soil is in good condition.

1:60 (1lb. in 6 gallons of water) where the soil is wet.

The damage caused by these grass-grubs in a pasture shows the havoc the pest may make of a lawn.

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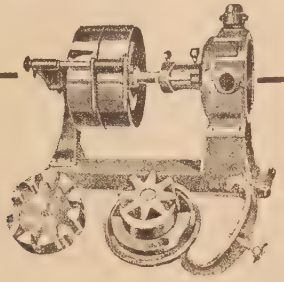

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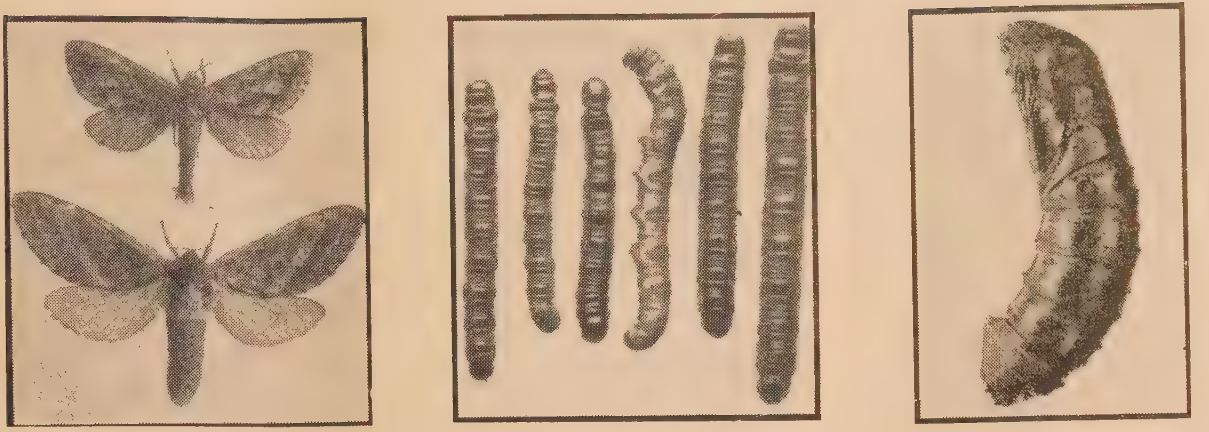
THE GRASS CATERPILLAR



Left—The adult insect is a large, dark-brown or grey moth which flies at dusk in October. Males (upper) are usually smaller than females (lower) and show wing markings more plainly. Middle—In the injurious stage the caterpillar is up to 2in. long and a dirty grey or green. It is not curled like the grass-grub. Right—The resting or chrysalis stage may be found in tunnels in September or October. The case is chestnut brown.

1:40 (1lb. in 4 gallons of water) for local application to large rosette weeds or mats of weed.

One application, correctly applied, should result in an almost complete kill of normal lawn weeds. Where there are deep-rooted weeds, and ones with dense old crowns, several general applications may be necessary before the kill is complete, or weeds which survive previous treatment may be given a further individual treatment.

Sodium chlorate

Sodium chlorate is inflammable and dangerous to handle, and precautions must be taken if accidents are to be avoided. It is especially important that clothing wetted by the solution should be washed before it dries. Friction may cause dry cloth impregnated with the chemical to ignite.

A 2½ per cent. solution of sodium chlorate (prepared by dissolving 1lb. in 4 gallons of water) is usually used, but it is not as satisfactory as arsenic pentoxide; it is slower in its action and the grass recovers much more slowly, which has the great disadvantage that seedling weeds and moss may become established before the grasses fill the spaces formerly occupied by the weeds which have been killed. The more lasting toxic effect of the sodium chlorate on the soil makes it necessary to wait several weeks after treatment before sowing grass seed, whereas seed may be sown with safety about two weeks after using arsenic pentoxide. Sodium chlorate tends to make the soil more alkaline, which may favour the return of clover; arsenic pentoxide has the reverse effect.

Proprietary weedkillers

Little can be written about proprietary weedkillers, as there are few records of their trial in New Zealand against the standard weedkillers. In the past arsenic pentoxide has given such good results that it has been difficult to find anything more economical and satisfactory.

Hormone weedkillers

The newly-developed weedkilling chemicals of the hormone class show considerable possibilities for control of lawn weeds. An article on this subject appeared in the "Journal of Agriculture" for September, 1946.

Weeds can develop only with difficulty in a strong, correctly-managed sward. The use of chemical weedkillers should be needed only as an emergency measure when, as a result of neglect, the lawn has to be rejuvenated. There is no point in clearing a lawn of its weed population unless the lawn is correctly managed thereafter.

Grass-grub

Of all pests and diseases attacking lawns, the grass grub (the larva of the brown beetle *Odontria zealandica*) is the one which causes greatest damage and anxiety. If the pest occurred with equal severity every year, measures for its control would probably become an annual part of routine lawn management. Fortunately, heavy infestations usually occur infrequently, and in normal seasons, though the grubs are usually present, the numbers are not sufficient to ruin a lawn.

The lumbering brown beetle invades gardens in hordes for several weeks during the evenings of late October, November, early December, and sometimes even into January, and feeds ravenously on the leaves of many types of trees, shrubs, crops, and garden plants. Eggs are laid in the soil or among the roots of plants. The eggs develop quickly into small grubs, which feed on the roots of a wide range of plants. The grubs increase in size and appetite, so that by early autumn they are destroying large amounts of root. During that period their presence shows up markedly in an infested lawn, especially during a dry autumn, as any injury to the roots may result in the death of the grass and an unsightly appearance of the lawn. As the weather becomes colder the grubs move to lower levels of the soil for the winter, to appear near the surface when the soil warms in the spring. Once again they feed on the roots, but at that time of the year, when the lawn species are making vigorous growth, the damage is not severe and may not even be noticeable.

Tunnels of the grass caterpillar go down 6 or 9in. into the soil, and the caterpillars feed on leaves and crowns of grass plants.

The grubs pupate in late spring and reappear a few weeks later as adults, thus completing the life cycle in one year. Flights of brown beetles may occur at other seasons of the year, though in lesser numbers, and grubs may be found in the soil almost all the year round.

It is necessary to understand the life cycle of the brown beetle to effect a control. Though several methods of destroying the pest are available, they are often applied after the damage has been done and when it is too late to effect a control.

Satisfactory results have followed the use of arsenate of lead powder (spray quality) at the rate of 1½oz. to the square yard, incorporated with the loose surface soil before the seed is sown, or applied as a spray through a watering can to established lawns, in which case the application should be followed at once by watering with clean water. Though the use of arsenate of lead in this way may appear expensive, its effect is lasting, for one such application should proof the lawn against attack for three to six years. If smaller amounts are used as a surface dressing, watered into established turfs, or distributed before seeding, the effects are not so lasting; ½ to ¾oz. should proof the lawn for one season but would require to be applied annually. Annual treatment of an established lawn should be given when the beetles are on the wing.

Several methods are available for destroying the grubs once they are in the ground. The effectiveness of the methods depends on their timely application and the thoroughness of the work, for it is not much use killing the grubs when they have done the damage, which coincides with the period of summer and autumn drought. Injury is reduced to a minimum if the lawn is kept moist and the plants are able to renew roots which are destroyed. Rolling, to maintain contact between the surface and lower levels of the soil, may assist. The use of water in reducing grass-grub damage is probably second only to arsenate of lead in effect.

Other chemicals may be used to give some measure of control of grass-grub, though none of them proofs the lawn against subsequent infection.

Carbon disulphide injection: Carbon disulphide should be handled with extreme caution, for, as well as being poisonous, it is extremely inflammable and may burn with almost explosive violence. The fumes penetrating through the soil kill the grubs, and it is necessary to insert the liquid into the soil to a depth of 3 to 4in. at 1ft. intervals, avoiding contact with the grass. The holes should be plugged immediately the poison is in the soil. The amounts to use are 1/5 to ¼oz. to a hole on sandy soil and ⅓oz. on heavier soil. The chemical can best be applied in this way with a soil injector.

Carbon disulphide emulsion: A stock emulsion is prepared by using seven parts by volume each of carbon disulphide and water and one part of a suitable coal tar disinfectant. The carbon disulphide and disinfectant should be mixed and shaken vigorously until a thick creamy liquid is obtained. The water is then added and thoroughly mixed. The stock emulsion should be satisfactory if it remains in the form of an emulsion and the carbon disulphide does not separate out and float on the surface. One part of this stock emulsion is diluted with 135 parts of water and applied through a watering can at the rate of 3½ gallons of the solution to the square yard of lawn surface. The application should be made slowly to allow the liquid to soak into the turf and prevent it from lying in pools, where damage to the plants would result.

Coal tar distillate: A coal tar distillate weedkiller has been used, diluted in 150 parts of water and applied through a watering can at the rate of 3 gallons to the square yard of the lawn. Again the speed of the work is governed by the rate at which the soil will absorb the suspension, and it must be followed immediately by 3 gallons of clean water to the square yard or severe burning will result. Such treatment should kill the grubs in the turf, and should be applied as soon as obvious signs of grass-grub attack are noticed.

Naphthalene: Though naphthalene is useless on the turf, it may be worked into the top 3in. of soil at the rate of 3oz. to the square yard when preparing land for sowing. It should be applied at least a month before the seed is sown.

Where the turf has been killed in patches, and can be lifted as a mat, little can be done but returf or reseed to bring the lawn back to good condition.

Subterranean Caterpillars

The surface-feeding subterranean grass caterpillar, which is capable of ruining a lawn, is also known as the porina grub, and is the larva of a large, heavy, night-flying native moth which is on the wing during spring and summer.

When fully developed the caterpillars may be up to 3in. long, with soft grey-black bodies and black heads. They live in burrows in the soil and at night come to the surface, where they feed on the grass. They can defoliate a lawn so severely that the plants die. Such damage does not occur usually until late autumn or early winter, when the soil may be studded with holes the size of a pencil which are used by the caterpillars in coming to the surface.

This pest is best controlled by poisoning, using a bran and arsenate of lead powder or Paris green bait. The caterpillars are voracious feeders and will take the bait without sweetening, though sugar is usually used in making up this poisoned bait. Two pounds of bran mixed with 1oz. of Paris green or 2oz. of arsenate of lead are sufficient for one broadcast application to 1500 square feet of lawn. The bait should be moistened to a crumbly consistency and applied broadcast in the evening when the weather is warm and fine.

Both Paris green and arsenate of lead are deadly poisons, and all precautions must be taken to keep them and the poisoned bran properly labelled and away from children, pets, and poultry.

The bait is most effective if used in January, when the grubs are ½ to 1in. long. Applications in February and March may be required if the lawn is very severely attacked; that can be ascertained by lifting a few turfs and counting the number of caterpillars.

Another method of poisoning the caterpillars is to spray the lawn with arsenate of lead at 3lb. to 100 gallons of water, with ½ to ¾lb. of lime casein spreader, making sure that the spray wets all the grass leaves.

By April damage to a lawn may be very obvious and the lawn almost ruined, and at that late period the destruction of the grubs may not lead to the regeneration of the lawn grasses. During the winter the caterpillars become inactive and later emerge as moths. As with the grass-grub, the infestation does not necessarily occur on the same area each year.

If the presence of caterpillars is suspected, the lawn should be examined at night. If many caterpillars are seen, the bait should be prepared and distributed or the lawn sprayed without delay. In the daytime the presence of the grubs will be indicated by the small tunnels or burrows in the soil. Dr. D. Miller, of the Cawthron Institute, Nelson, suggests that the presence of more than five caterpillars to the square foot should be regarded as the signal to use the poisoned bait.

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Acknowledgment

The help given by the Director and officers of the Plant Research Bureau, Grasslands Division, Department of Scientific and Industrial Research, in reading the draft of this article and making valuable suggestions is acknowledged.

The Bee Tree

THE tree grew close to the cottage wall. The height of a tall man, its slender trunk was thrust up straight, holding aloft the graceful candelabra of its blossoming boughs. Each tapering branch was covered with masses of tiny flowers the colour of sapphires, and the sunlight shining on those rounded blue petals and rosy stamens and the pink-tinged buds at the tip of every spike made the tree look as if it were lit by a myriad lavender flames. Small wonder it attracted the honey-gatherers in such swarms that they hovered about the bright blue corollas from dawn till dark; hence its local sobriquet, the bee tree. It struck an exotic note in the neat little garden where familiar favourites such as black-eyed Susans, velvety brown wallflowers, golden flags, flamboyant marigolds, and demure ox-eye daisies mingled happily with native veronicas of the whipcord variety and scarlet and yellow kaka beaks.

The house itself was painted in polyanthus tonings of deep cream and red and the front door had side panels of ruby glass patterned with rose and maidenhair fern, and the long, white lace curtains at the double-hung windows had borders of sunflowers or roses or violets. Even the kitchen garden in its fenced enclosure was not exempt from floral adornment, gay blooms edging the vegetable beds, and a well-tended rosery sharing the corner plot with the rhubarb. The little old lady who lived there so long was noted for her love of flowers. They were her other children and they flourished at her touch. She could coax the sickliest straggler to take braver hold of the soil and blossom, and she had a prodigious memory for horticultural details; she never forgot the name of a plant even if she heard it only once. Whenever she went for a holiday she always brought back a lot of new cuttings for the garden. Her husband recalls how on one occasion when she was away she sent him several big bundles of plants with due instructions as to their disposal. It was late by the time he got home from the day's work and most of his gardening had to be done in the dusk, which was probably the reason why he got all the seedlings mixed up and put them in the wrong places. He still gives a reminiscent chuckle as he recalls her remarks regarding his handiwork!

The Spencer men have invariably married women of spirit. Grandfather James Spencer, founder of the New Zealand branch of the family, was the first settler at Bluff, clearing the bush near the site of the present town hall, and setting up a store to supply the sealers whose ships put in to the harbour from time to time. He spent the earlier part of his youth soldiering, having fought under Sir John Moore at Corunna and the Iron Duke at Waterloo, and after the Napoleonic Wars, when the French emperor was exiled to St. Helena and the British army was disbanded, young James, still avid for adventure, came out to Australia and joined a whaling crew. He made his first trip to the southern shores of New Zealand about 1820, returning to take up permanent residence there in 1824. Thus Bluff became a settlement fully 16 years before Wellington.

Most of the early explorers in the south were whalers and sealers and it was probably their reports of the plentiful *Phormium tenax* thickets about the port that caused the visit of the Leith expedition in 1810 to investigate the prospects of procuring flax fibre in sufficient quantities to establish a canvas and cordage industry for the navy. The party walked overland as far as the native village at Omaui, "the place of the Maori," on the estuary of the New River, or the Oreti as it is now called. Unfortunately this and a subsequent scheme suffered so many setbacks that they had to be abandoned and the colonising of Bluff did not commence till the close of another 14 years, when James Spencer started his trading post. Other settlers soon followed, and the Maoris, attracted by the opportunities for trade, gradually began to migrate from Omaui to Bluff. The land at Omaui is still theirs, however, and the semicircle of stones set in the ground saucer fashion to hold the fire over which the whalers swung their trypot of old can be seen there to this day.

Oue, on the opposite side of the Oreti, was also a whaling station and several bad wrecks occurred at the river mouth, which has a very dangerous entrance. Later, when the whales started to abandon the Foveaux Strait area (their numbers having been considerably depleted by intensive killing) and the chase had to be carried on much further afield, more and more whalers tended to become settlers. They were a fine type, these seafarers, and showed a decided aptitude for agriculture.

Early in the 1840's James Spencer embarked on yet another adventure, that of matrimony, wedding Kauri Pohatu at Waikouaiti, where the first southern mission station was opened by the Rev. James Watkin at the request of the owner of the whaling base there. This was one of the first marriages solemnised in those parts by the Wesleyan missionary who had the whole South Island for his parish. The bride was tall and extremely handsome and possessed in full degree the superb courage for which her race is renowned. Her descendants tell of how some pakeha officials once landed on the small island which was her property in an attempt to dispossess her. Far from being daunted by the superior forces of authority arrayed against her, she seized a tomahawk and, brandishing it above her head, advanced purposefully upon the intruders. They retired, completely routed, leaving her in undisputed ownership of the land that was rightfully hers.

She had two sons, James and William, and the latter married Louisa Coupa, whose father was a Scottish immigrant. She proved a worthy helpmate for a pioneer indeed, bringing up a family of 13 and living to the great age of 87. Bee Tree Cottage belongs to the son whom she named after his father. William, junior, started work in J. G. Ward's grain business in 1884, staying with the firm for six years before following the sea as his forbears had done. But he knew that if he stayed overlong at sea he would become too restless to settle anywhere, and so after seven years of roving he chose a shore job and worked as a storeman on the Bluff wharves. His wife was the daughter of a Portuguese whaler named Goomes, her birthplace being Bravo Island in Paterson Inlet, the largest port of Stewart Island.

With his stalwart physique and robust sense of humour William Spencer could easily pass for a man in his early sixties instead of the late seventies. Since his wife's death he has spent much of his time with his daughter and schoolboy grandson, who dwell but a few doors down from Bee Tree Cottage. His daughter has her mother's dark eyes and flower-loving fingers. She delights to spend long hours in her garden, and beside her white-walled bungalow burn the tall blue tapers of a bee tree in full bloom.

Mary

SUCCESSIONAL PLANTING IN THE MIXED FLOWER BORDER

[*Green and Hahn Ltd. photo.*

Daffodil and narcissus bulbs planted in grass will make a fine display. The best method of planting is to lift squares of turf with a spade, remove the soil below to a depth of about 6in., add half a handful of complete flower border fertiliser and chop it into the soil, then put two or three bulbs as far apart as possible in the hole, and replace soil and turf.

IN this, the fourth article in the series on rules of good flower gardening, J. P. Hudson, Horticulturist, Wellington, deals with the precept "Give young plants ample room in which to develop."

IN previous articles in this series it has been shown that by following certain basic principles the flower border in the home garden can be made much more colourful and effective. In last month's "Journal" the need of never missing a sowing or planting date was stressed, but there is bound to be a period when the borders are out of flowers and dull if planting a new batch of plants is delayed until the borders look shabby. Successional planting is needed to keep flower borders continuously bright.

Importance of Light to Young Plants

However, successional planting does not mean just setting out young plants between the old ones—it is not quite as easy as that, because most plants need moisture at their roots and light for their leaves in order to grow. Some plants, such as the ferns, can grow where there is relatively-little light, but nearly all the plants which are grown in the flower border need direct sunshine on their leaves for at least part of the day if they are to thrive. Leaves that are shaded from the direct rays of the sun turn pale green or yellow (etiolated), often become thin and weakly, and can neither do their work of manufacturing sugars and starches for the plant nor resist the attacks of diseases.

In Nature, and especially in the New Zealand bush, many plants are able to exist in shady places on the forest floor when young and send out stems which in some way or other struggle up into the light among the tree tops. Once their heads are in the light these plants thrive and develop to maturity.

Unfortunately, most garden flowers have none of this ability. Unless they have light from their early, seedling stages they become spindly and weak and often die. Even those which may survive and ultimately grow through neighbouring plants into the light are usually short-lived and incapable of producing a worth-while display of flowers.

Water Equally Important

A constant supply of moisture to the roots is just as important to young plants as the supply of light. Plants cannot grow without enough moisture, lack of water first causing growth to cease and then leaves and stem to wilt. Plants can recover from a certain degree of wilting, but there comes a point when wilting is so severe that the tissues cannot recover and the plant dies.

As the plant's water supply is all taken up from the soil by its young roots, it follows that a well-developed root system is needed by the plant to reach out and use the available water in the soil. A plant with small or mutilated roots is ill-equipped to grow in a dry soil where a plant with longer, deeper, and more numerous roots could probably grow quite well.

Thus young plants set out among older ones will be poorly equipped to use such water as the soil may still contain, especially if they are planted in summer and autumn, when the soil moisture has been drawn on heavily by plants already in the border. For that reason it is important to water plants in and, if the soil is dry when they are planted, to continue to water them until they have developed a good root system.

Successful Successional Planting

There are thus two reasons why young plants "just popped in" between older ones are often a total loss, disappearing from sight and mind as they are overshadowed by their more strongly-growing neighbours, which rob their leaves of light and their roots of moisture. No wonder there is little left of the young plants, on which much care may have been lavished, when the overgrown old plants are finally pulled out.

To establish new plants successfully in a flowering border it is always worth while to raise and grow them elsewhere to fairly-large size so that they are well enough developed when planted to compete with neighbours for light and soil moisture. Hence the frequent emphasis laid in these notes on the advantage of raising successions of plants in boxes and pots for planting out in the border. (Articles on this subject appeared in the July and August, 1947, issues.)

Alternatively, if seeds are sown or small seedlings planted out in the border, they must be put only in fairly-extensive gaps where they will not be overshadowed by the tops or robbed of moisture by the roots of established neighbours. Coupled with this replanting policy, old annuals should be ruthlessly torn out when they have passed their peak, and perennials such as marguerites and hybrid wallflowers should be cut back hard, even though they still have quite a number of flowers, to leave room for the proper development of the new plants.

Attention to these points will enable successional plantings to be made successfully, avoid wastage and loss of young plants, and ensure that the border makes a continuous display and that there are always plenty of young plants coming into flower in the border as the old ones fade.

Garden Work for April

Annuals such as larkspurs, calendulas, sweet sultan, love-in-a-mist, and cornflowers, sown thinly now in

Steep banks are difficult features to keep tidy and neat. The easiest way to treat them is to grade them evenly and sow them down in grass. Mowing is not such a problem as appears at first sight, as sloping banks can be mown quite easily across the slope if an assistant walks along the top of the bank holding a rope tied to the machine to prevent it from slipping down the bank.

vacant patches in the borders, will winter as small plants and flower early next year. It is essential to thin out the seedlings as they grow until they are left 8 to 9in. apart, as each mature plant will occupy at least that space. Overcrowding leads to a short, disappointing flush of flowers, after which the plants die off altogether.

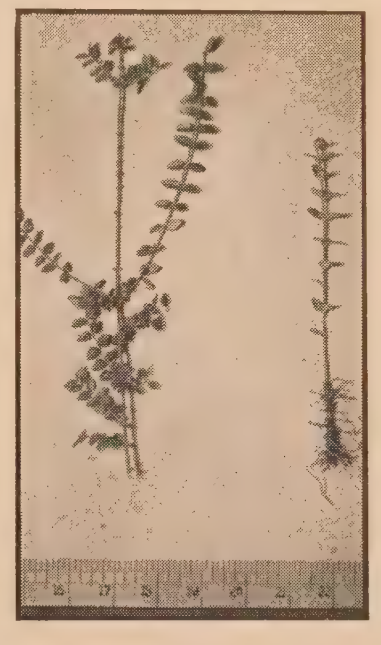
Begonias that have been grown in pots are now getting past their best and should be gradually dried off as their final blooms fade by watering less and less until the foliage and stems have changed colour and died. Pots can then be put on their sides and stored in a cool place, or the plants can be turned out of the pots and the soil very gently removed from the "bulbs," taking great care not to injure the skin; the bulbs can then be stored in a cool, dry place in boxes of perfectly-dry sand. It is essential that bulbs be stored in a dry condition to avoid any chance of premature growth, and they must be protected from frost, which may injure the bulbs or kill them outright.

Bowls of bulbs are usually ready to bring indoors six to eight weeks after being planted and stood outdoors to root in a cool, shady place. Wash the pots and bowls, freshen up the surface of the soil by pricking it over with a piece of stick or a nail, then put them in as light and cool a place as can be found in the house. A warm room or a place far away from a window will cause the leaves to grow too quickly and result in long, floppy foliage which overtops the flowers. Pots should not be taken into a warm room until the flower buds are clearly visible. For the same reason pots and bowls of bulbs should be watered sparingly until the flower buds show, as too much water can also cause excessive leaf growth.

Chrysanthemums in pots can be fed in autumn to increase the size of flowers by watering them every 14 days with liquid animal manure, diluted with water to the colour of weak tea, or by watering in a dressing of the pot-plant food referred to previously in these notes (see September, 1947, issue). Chrysanthemums can be spoiled when just coming into bloom by caterpillars, which nibble the young petals and make the flowers open ragged and lop-sided. Plants should be sprayed with lead arsenate or, preferably, dusted with D.D.T. dust at the first sign of caterpillars.

Cinerarias make a fine display in spring and early summer if planted in a fairly-rich soil in partial shade in districts not liable to severe winter frosts. The ground should be prepared for planting by working into it a good dressing of well-rotted compost and 2oz. a square yard of complete flower border fertiliser (three parts of blood and bone, two parts of superphosphate, and one part of muriate of potash). Box-grown plants should now be planted out about 15in. apart.

Cold frames can still be used to house a late batch of cuttings of hybrid wallflowers, geraniums, catmint, pelargoniums, sage, violas, pansies, verbena, marguerites, and a great range of other garden plants. These cuttings can be left in the frame until spring, by which time they will have made well-grown



[Photo News Ltd. photo.

Cuttings of *Lonicera nitida* are taken by gently tearing off young side shoots with a heel of old wood, removing the lower leaves, shortening the cuttings to 6 to 8in., and inserting them firmly in a shady place outdoors. Cuttings of many other shrubs are taken in the same way. Left—A branch of *Lonicera nitida* showing several side shoots suitable for propagating. Right—A rooted cutting photographed in autumn.

plants ready for setting out in the borders.

Cuttings of many shrubs, taken now and inserted firmly in the soil outdoors, will root by spring, and this is an easy and popular way of increasing such plants as escallonia, privet, *Lonicera nitida*, willows, tamarisk, buddleias, laurel, lavender, rambler roses, and shrubby veronica. Cuttings taken now are usually referred to as "hardwood," as the whole length of the stem to the tip has become woody. Each cutting should be 8 to 10in. long (3 to 4in. for lavender), should have all leaves removed from the lower half of the shoot and the bottom cut off neatly below where the lowest leaf was attached to the stem, unless there is a "heel" of old wood, which should be left, and then should be inserted firmly into the soil to about half the depth of the cutting. Firm planting is essential, as loose cuttings will be rocked by the wind and will not root.

Dahlia roots as well as the leaves are susceptible to frost, and only in more or less frost-free districts can roots safely be left out in the ground through the winter. Elsewhere, when the leaves and flowers shrivel in the autumn the stems should be cut down to about 6in. high, labels attached to the stem stubs if the varieties are named, and the complete root then carefully dug up with a spade. Care must be taken not to injure the tubers unduly, and especially not to pull the tubers from the main stems; that often makes them useless by removing next year's buds, which are formed on the necks of the tubers where they join the stem. Put the roots in an airy place where they can dry off preparatory to being stored.

Geraniums are hardy in many parts of New Zealand, even in districts that experience occasional frosts, but they will be killed in districts where the soil is frozen in the winter. In such places plants should be dug up in the autumn, put in boxes with soil loosely packed between the roots, and stood in a light, airy, frost-free place for the winter. The soil should be lightly watered from time to time to prevent it from drying out altogether, but very little water is required. Plants can be potted up, cut back hard, and grown in a windowsill, where they may flower during the late winter, but newly-rooted cuttings make better pot plants.

Gladiolus corms should not be skinned before being put away for the winter, as they tend to shrivel when stored without their skins. Even at this stage, however, corms showing bad scars, rotten places, or lumps should be discarded and burnt to reduce the risk of disease spreading to other corms in store. When quite dry, corms should be stored in a cool, airy, dry, frost-proof place, in open boxes or bags rather than in airtight tins, where they are likely to go mouldy.

Herbaceous plants in the flower border should be cut to within a few inches of the ground when the flowers fade and the stems die. If the plants have not been divided in recent years and are now in thick, overcrowded clumps, it will be worth while to lift them during the winter, dig over the border thoroughly, and replant small pieces taken from the outsides of the old roots. That will usually lead to far stronger spikes and finer flowers being produced in the next season. Before the herbaceous plants which it is intended to lift and divide later are cut down, the clumps should be carefully labelled so that only the most desirable are used for replanting. After they have been cut down is too late to try to remember which was which. Some herbaceous plants such as peonies and hellebores are slow in flowering again after being moved and normally should not be disturbed.

Hydrangeas growing as pot plants to flower next spring should be potted on into 5in. pots, using John Innes potting compost. Stand the pots outside in the full sun until the leaves begin to discolour, after which the pots can be brought indoors or put in a sheltered place where they will not be soaked by rain. In winter only sufficient water is needed to keep the soil slightly moist, though the pots should not be allowed to dry out altogether.

Labels should be kept in good condition if they are to serve their purpose. To be most effective they should be painted with white-lead paint just before they are used by rubbing the paint thoroughly into the wood with a piece of rag. The label should then be written with a soft black lead pencil while the paint is still wet. Well-painted and well-written labels should last for more than one season but should be looked at each year and renewed when necessary. It is always worth while to have a plan of each bed and border and mark on it the places where named varieties of plants are set out. A plan is more permanent than any labels and not so likely to be lost.

Lawns with worn patches should now be repaired by pricking over the bare places with a fork, breaking the soil down to a fine state, and adding more soil if the places have been worn down below the general level. After the soil has been firmed with the foot, superphosphate should be sown evenly

Sunlight and Milk
do NOT agree

When milk is exposed to the rays of the sun, its flavour is spoiled (by the oxidisation of some of the milk serum constituents) and it loses its Vitamin C content.

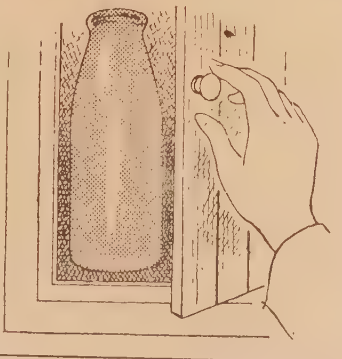
Even indirect light is harmful to milk. A bottle of milk exposed to light that entered through frosted glass for two hours lost 15% of its Vitamin C. Where is **your** milk kept at home? Is it allowed to stand where it receives full light or sunlight?

Get the best out of your milk by shielding it from sunlight and light outside and inside.

KEEP IT COVERED AND IN THE DARK

This is the way you preserve its **flavour** and **food value.**

Issued by the Department of Health.



at the rate of 1oz. a square yard, followed by grass seed (a mixture of two parts of New Zealand chewings fescue and one part of Government Certified browntop, sown evenly at the rate of 1oz. of the mixture a square yard). The surface should then be very lightly raked to cover the grass seed.

Planting out becomes easier and less hazardous as autumn rains wet the soil more thoroughly. Plants set out in autumn reroot at once into the soil, which still retains some of its summer warmth, yet are unlikely to be tried by hot, scorching suns. Many flower seedlings planted out now from boxes will flower through the late winter months in the milder districts. Planting of the following should be completed at latest before the end of the month: Wallflowers, sweet Williams, Canterbury bells, forget-me-nots, hollyhocks, beauty stocks, aquilegias, polyanthus, primulas, pansies, violas, carnations, daisies, Iceland poppies, and lupins.

Other Tasks for the Month

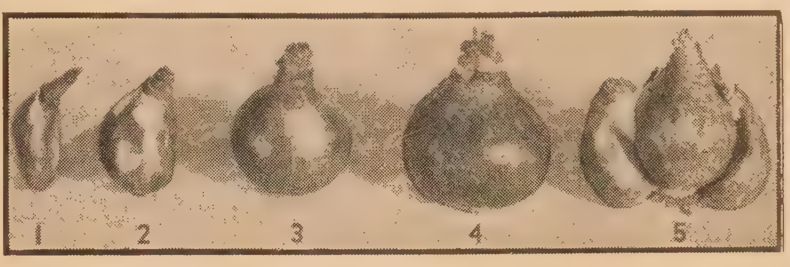
Any **anemones, spring-flowering bulbs, and rununculuses** still to be planted should be put out as soon as possible.

Lift the latest **gladioli** as the foliage changes colour.

Lily bulbs should be planted as soon as possible, and not later than the end of April.

Sow early-flowering **sweet peas.**

The Development of Flowering Bulbs



Daffodil and narcissus bulbs develop in a cycle which takes from three to five years. If the thin, flat-sided "offsets" (1 and 2) are planted and grown for a season, the largest may flower but most will produce only leaves. When lifted each bulb will have become a "round" (3), and it is these which produce the finest flowers if planted, each bulb bearing one good flower. When lifted, each round will have become "double nosed" (4). This will produce one good or two mediocre flowers when planted and grown on, and when lifted will have divided into a number of small bulbs clustered together. This cluster is called a "mother bulb" (5). Mother bulbs should not be split up but should be planted and grown on for a season. They do not usually flower, but the component bulbs will separate and at the end of the season a number of separate offsets can be lifted. That completes the cycle.

When planting daffodils and narcissi large offsets, rounds, and double-nosed bulbs should be set out where they are to flower; small offsets and mother bulbs are best planted for a season in an inconspicuous bed where they can grow and develop into flowering bulbs to be lifted in the following summer.

Virus Diseases

Virus diseases are mysterious ailments, the causes of which are still not understood, but their effects seem year by year to be becoming more painfully obvious to observant gardeners. Unlike some pests and fungous diseases, the virus diseases do not usually kill plants outright—in fact, it might be much better if they did and so prevented the affected plants remaining as centres of infection.

Leaves and Flowers Most Affected

Viruses affect all parts of plants, but their symptoms are most usually noticed on the leaves and flowers. Leaves, especially young leaves, may become blotched or spotted with light green or yellow markings or show "watermarks" in wavy, irregular patches or concentric rings. The discoloured places often die at a later stage, turning brown or black. Plants more seriously affected often become dwarfed and deformed, with curled, wrinkled leaves and twisted stems. Some viruses cause leaves to become thin, narrow "bootlaces" or produce streaks of dark colour on the stems.

Striping of flowers which are usually uniformly coloured is also the result of some virus disease as a rule but, as in the case of "broken" tulips, the general health of the plants may be little affected apart from the abnormal petal coloration. Fruits less commonly show symptoms of virus diseases but in some cases (for example, tomatoes) may be blotched, discoloured, or seriously distorted.

Whatever the detailed symptoms of viruses on different plants, the general effect is to lower the value of the plants by reducing their vigour or causing light crops of fruit, flowers, leaves, or roots of poorer quality than would be produced by healthy plants. Moreover, once a plant is infected with a virus it never recovers but remains infected for the rest of its life, passing on the infection to any new plants which may be raised from it vegetatively (by cuttings, division, layers, etc.).

Fortunately, most virus diseases are not transmitted to the seed, which usually grows into virus-free young plants. Peas, beans, tomatoes, and lettuces are among the few exceptions to this rule, as seeds of those crops can carry infection of virus diseases to the next generation.

How Virus Diseases are Spread

Not only do infected plants never recover, but they often survive indefinitely to serve as sources from which infection can be spread in a variety of ways, especially by the types of insect that feed on plant sap. After sucking sap from an infected plant such insects often inoculate healthy ones with the disease as they move from plant to plant in feeding.

Greenflies (aphides) are notorious spreaders ("vectors") of virus diseases. For instance, tulip "breaking" is spread by greenflies feeding on the leaves in the field or on the dry bulb in store. The important virus diseases of potatoes and cucumber mosaic of cucumbers and tomatoes are other examples of common virus diseases which are spread by aphides.

Spotted wilt of tomatoes, an even more important disease, is spread by thrips. These are narrow, active creatures up to 1/10in. long, ranging in colour from yellow to black, that feed on a wide range of plants by scraping the surface, eating the juice, and leaving the leaves or flowers with a characteristic scurfy, damaged surface. This disease has been recorded in New Zealand on tomato, tobacco, lettuce, iceland poppy, anemone, aster, calendula, nasturtium, peas, and a number of other plants of horticultural importance and threatens to become the country's biggest single garden scourge.

Certain virus diseases are spread by human agency by the handling of healthy plants after touching diseased ones. Virus infection is often spread in that way through tomato and tobacco crops.

Only One Control

Some virus diseases can be recognised at once but others are very difficult to diagnose correctly. In any case, it is not really necessary for the home gardener to be able to recognise and differentiate between the symptoms of all the many virus diseases that may occur on his fruit, vegetables, and flowers, as the treatment for them all is the same: Pull out the infected plant and burn it as soon as infection is noticed.

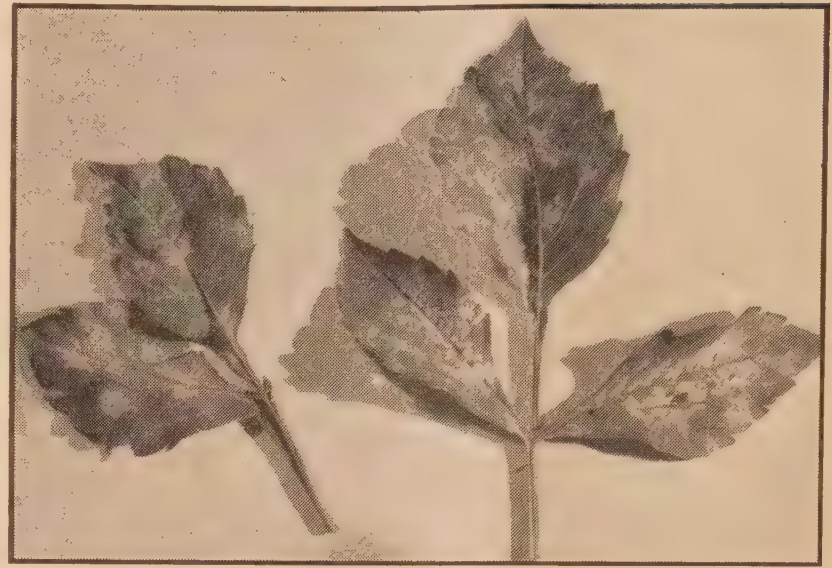
F. C. Bawden, the world authority on plant virus diseases, recently said that "Prevention is better than cure" may apply to most things but not to virus diseases, for which there is no cure. For the control of plant virus diseases, prevention is not merely a better way—it is the only way.

As infected plants never recover, and it is practically impossible to stamp out the insect vectors altogether, because they are so common and widespread, the only way of tackling the virus problem in the home garden is to be ruthless and pull out every plant seen to be stunted, abnormal, or showing any of the symptoms described. This policy should be applied even more strictly to plants which are to be divided or used as a source of cuttings or layers, as any virus present will inevitably pass to the offspring, which, being infected so early in their life, are likely to suffer severely from the disease.

Books on the Problem

Since plant diseases were first studied, about 30 years ago, a great deal has been written about them, but most of the authoritative books and papers have been highly scientific. However, two books on the subject which can be recommended to the home gardener, or to anyone interested in reading more about the subject, are "Virus Disease of Farm and Garden Crops," by K. M. Smith (Littlebury and Co., Worcester, price about 19s.), and "Beyond the Microscope," by K. M. Smith (Pelican Books, 1s. 9d.).

Though both were written overseas, they contain much that will interest the New Zealand gardener. Meanwhile, there is a need for a book dealing with the recognition of the virus diseases that occur here, as it seems likely that these diseases will become more widespread and troublesome in New Zealand unless they are much more widely recognised and infected plants more promptly destroyed by home gardeners and commercial growers. Aphides and thrips are no respecters of the garden fence, and gardens full of virus-infected perennial plants serve as centres from which infection is spread each year to neighbouring private and commercial gardens.



[Photo News Ltd. photo.

Dahlia leaves showing the "watermarking" characteristic of the spotted wilt virus disease. Dahlias are among the many garden plants attacked by this virus.

Spoons are not Accurate for the Measurement of Liquids

[Photo News Ltd. photo.

A READER has written to point out that the capacities of the many types of tablespoons on the market vary considerably, and a series of tests has amply confirmed his statement that spoons should not be used for accurate measurements. The spoons shown above are all "tablespoons" and all look much alike, yet the one on the left holds five-eighths of a fluid ounce and the one on the right five-sixths of an ounce, with the middle one somewhere between the other two in capacity. Thirty-two spoonfuls of the left-hand spoon are needed to make a pint and only 24 fillings of the right-hand spoon.

When recommendations are made about mixing spray fluids (or for that matter, taking medicine) the quantities suggested have been arrived at after careful research and should not be varied. If spray materials are used too strong, they may easily cause damage, apart from the fact that it is wasteful to use too much of them, but they may be completely useless if used at too weak a concentration. Accurate measurement of spray fluids is therefore essential if spraying is to be effective.

The only accurate way in which to measure liquids is to use a properly-graduated measuring phial, such as the one shown above, which can be bought from any chemist for about 1s. 6d. Every gardener should have a measuring phial.

Easy-to-make Toys for a Girl and Boy

THE making of toys that will be a delight to small sons and daughters can provide parents with an interesting home occupation for the coming winter evenings. This article describes the making of some model furniture and a tip truck which are both inexpensive and of simple design.

Kitchen Furniture

MATERIALS required for the kitchen furniture are thin wooden board or plywood cuts, battens, beading, dowels, thin short nails or pins, liquid glue, sandpaper, and blue and white paint. All the measurements given are approximate.

The dresser.—For the back a piece of wood 3½in. wide by 5¾in. high is needed and for the sides of the cupboard two pieces 1¾in. by 2½in.; the top of the cupboard measures 4in. by 1¾in. and the base 3in. by 1¾in. The shelf sides require two pieces 1in. by 3in. The shelf itself measures 1in. by 3in., the top of the dresser 1½in. by 4in. Nail and glue all pieces, joining the back first, then place the shelf in position and nail and glue it. The doors measure 2in. by 1½in. each. Glue a ½in. piece of thin dowel to the centre front edge of each door for handles, and hinge the opposite edges in position at top and bottom with pins driven through table top and base. Glue a tiny square of wood just inside the junction of the doors to prevent their slipping inside. Add a piece of decorative moulding to the top of the dresser, then paint it inside and out.

The sink.—For the back a piece of wood 3⅜in. by 4½in. is needed. The side pieces for the cupboard measure 2¾in. by 1½in., and 2⅝in. by 1½in. Base and shelf are 1⅜in. by 1½in. and the supports 1⅜in. by 1½in. high. Nail and glue the pieces to the back, using the shorter side of the cupboard on the inside to give a slant to the draining board. Make the door 1½in. by 1¼in., with a handle of dowelling, and fasten it in the same way as the doors of the dresser. The front and back of the sink measure 1¼in. by 1in. high, two side pieces are 1in. square, and the base 1in. by 2in. Two 1in. pieces of wire fastened to the back board over the sink are bent downward to form taps. Another 2in. length of wire is fastened under the sink and bent into an S shape to resemble the waste pipe, its other end being bent backward into the wood. Glue the sink in position. The draining board is a thin piece of wood 1in. by 2in.; some grooves cut in it make it look more realistic. Nail it to the sides above the cupboard.

The table.—The top measures 3in. by 4in. and the legs are 2¼in. lengths of ¼in. square wood. Glue and nail them in position, then cut lengths of ⅛in. by ½in. lath to fit exactly inside the legs and glue them in position. Paint the top white and the legs and sides blue.

The chairs.—Cut two pieces of ¼in. square wood each 3½in. long for the back legs and two 1¼in. lengths for the front legs. Cut seven 1¼in. lengths of thin dowel and with a penknife point all the ends. Drill a hole in the back legs ⅜in. from the top, another ⅜in. from the first, the next 1½in. further down, and the last ¼in. from the other end. Glue four of the pointed dowels into each hole like the rungs of a ladder. Glue one rung between the two front legs ¼in. from the lower end. Drill holes in the front of the back legs ¾in. from the base, make corresponding holes at the back of the front legs, and glue the remaining two rungs in position. For the seat, cut a piece of wood 1⅝in. square and cut off a ¼in. square at two adjoining corners. Glue the seat in position.

The wringer.—Cut two 4in. lengths and one 1in. length of ⅛in. by ½in. batten; sandpaper down two corners of the long pieces and all four of the short one. Drill a hole ¼in. inside both ends of the short piece and two holes in each long piece, the first 1⅛in. from the top and the other ¼in. below the first. Cut two 1⅞in. lengths of ⅜in. dowel and another ⅞in. long. Screw the short piece to one end of the short piece of batten for the handle; screw the other end through the lower hole in a long piece into one length of the dowel. Nail the other dowel through the other hole and nail both sides through the corresponding holes in the batten. Cut two pieces of thin board 2⅝in. by 2in. and cut a ½in. groove ⅛in. deep out of every side. That is done by sawing through the edge for ⅛in., then knocking out the wood with a chisel. Glue the battens to one piece ¼in. below the lower dowel and the other as a base. When the glue is dry, paint the table top white and all the rest blue except for the plain rollers.

The broom.—The head is made from a typewriter brush. Cut off the brush head, trim it so that the bristles are in the exact centre, and sandpaper all corners to round them. Drill a hole at a slant in the exact centre of the wood and glue the handle—5in. of thin dowel—in position.

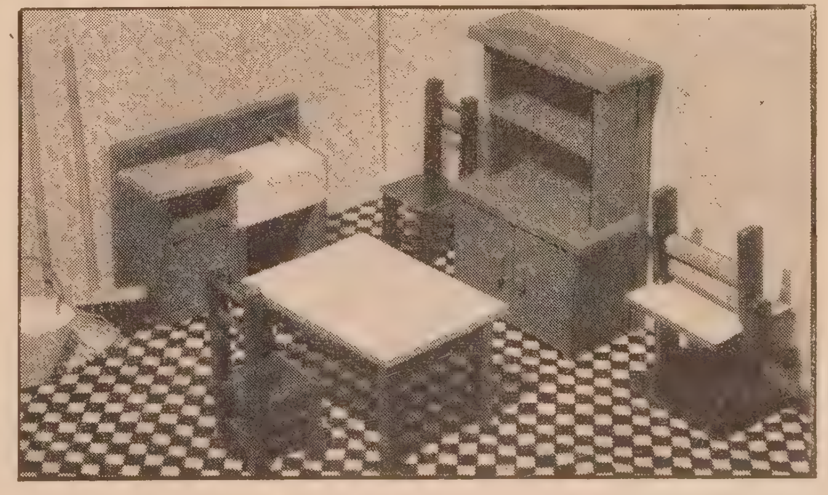
The mop.—Make a thick tassel with string or yarn and secure the ends well. Cut a 5in. length of thin dowel and fasten the tassel to it with a pin. Trim the tassel to 1½in.

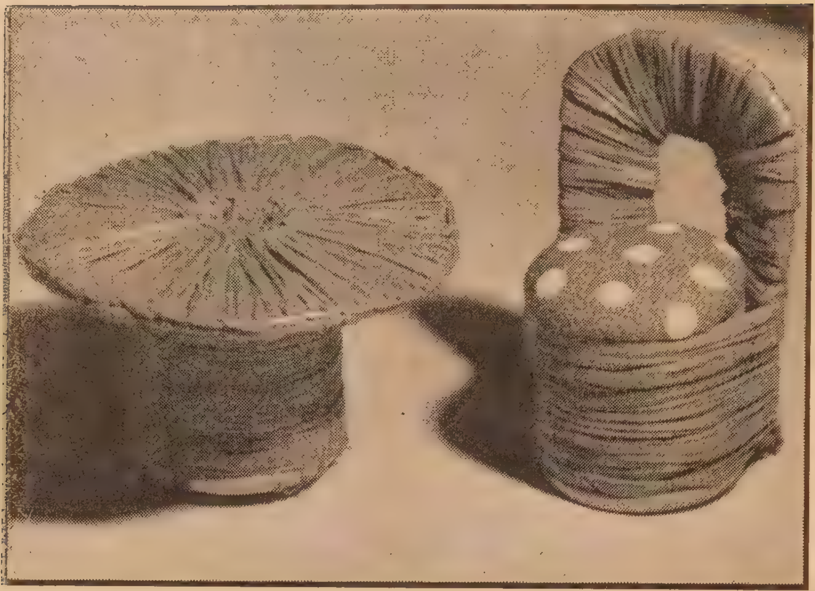
The bucket.—Draw a 7in. circle on a piece of cardboard and another 1¼in. inside the first, and cut out the shape; then cut it into two equal pieces. Draw another circle ¾in. in diameter and have spikes radiating from the circumference all round. Cut out this star shape and bend up all the spikes. This is the base of the bucket. Roll the first half shape up until it fits the base, and glue the "side seam;" then glue the base to the outside of this half shape and glue the other half shape round the outside. When the glue is dry paint the bucket, and when the paint has dried make the handle with 3½in. of plastic-covered flex.

Fireside Chair and Table

Materials required to make the miniature fireside chair and table are two cotton reels, raffia, cardboard, a small piece of cotton wool, and a small piece of any pretty material.

The chair.—Cut the chair back from cardboard (if the cardboard is thin use it double). Wind raffia all round the cardboard shape and through the hole until it is completely covered. Fasten the end of the raffia securely. Pad the top of the cotton reel. Cut





a circle of material about 2½in. in diameter, place it over the top of the cotton reel, and bind it tightly in position. Place the chair back in position and bind it tightly to the cotton reel. Wind raffia tightly round the cotton reel so that it is completely covered and fasten the ends securely.

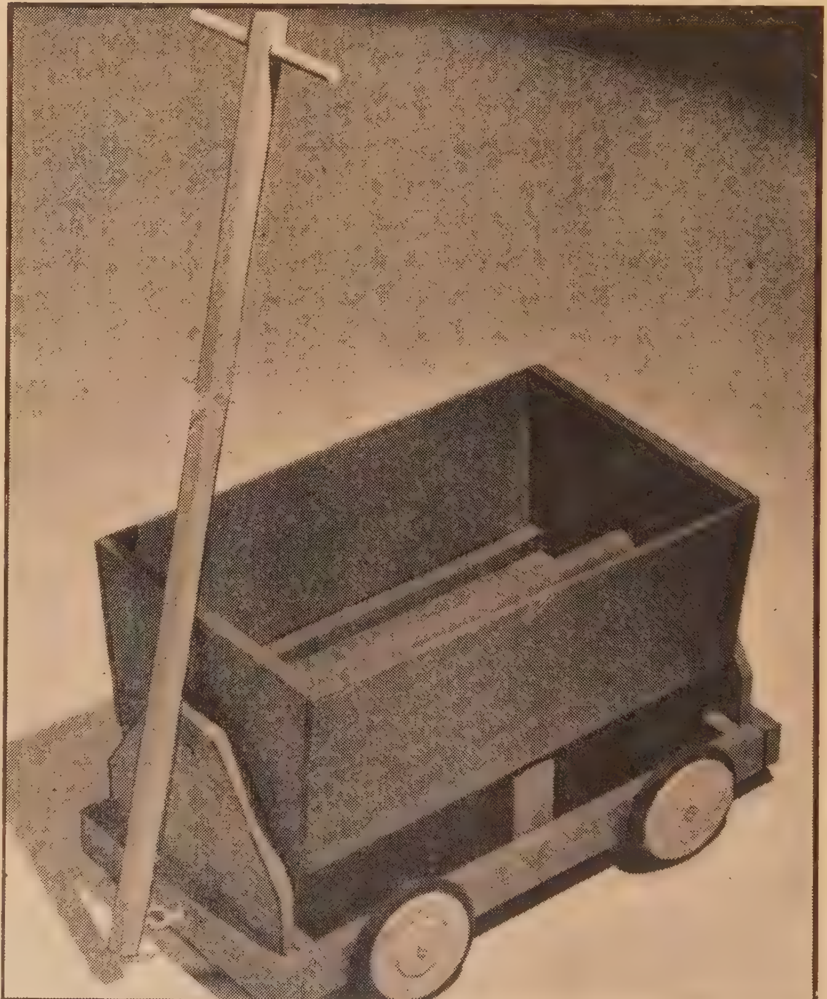
The table.—Cut a circle of cardboard the size required for the table top, then cut a hole in the centre ½in. in diameter. Cover the circle with raffia by winding it through the hole in the centre. Fasten it to the top of the cotton reel by threading a darning needle with raffia and taking stitches through the hole of the cotton reel to the underneath of the table top. Darn over the hole in the centre with raffia and buttonhole stitch the edge lightly and rather loosely. Bind the cotton reel until it is completely covered and fasten ends securely.

Tip Truck

All the measurements given in the directions for making the tip truck are those used for the original model, but any size box may be used and the measurements varied accordingly. The materials needed are a wooden box about 9in. wide by 14½in. long by 9in. deep; for the frame, two pieces of wood 17½in. long by 1½in. wide by ½in. thick, two pieces 8in. long by 1½in. wide by ½in. thick, two pieces 9in. long by 1½in. wide by ½in. thick; two pieces of wood for uprights at the end of the frame 8in. wide by 5in. long by ½in. thick; a piece of wood for the handle 17½in. long by ½in. square; a piece of thin wooden curtain rod for the crossbar of the handle 5in. long; a piece of broomstick 16in. long; two pieces of wood for the brakes 4in. long by 1½in. wide by ½in. thick; four wheels (empty shoe polish tins can be used for these); one eye screw; one large staple; nails; screws; paint.

Build the frame by nailing the 17½in. pieces of wood to the 9in. pieces. Then shape the tops of the two upright pieces to a blunt V shape and nail the pieces to each end of the frame on the inside. Nail to these the 8in. pieces. Round off one end of each brake and screw through the straight end, one each side, to the middle of the frame on the inside, so that they can be lowered or raised.

Make a hole at each end of the box about 3in. from the bottom, push the broomstick through, and nail the two ends of the broomstick to the inside of the uprights so that the box can tip over between the frame. Drill a hole through one end of the handle about 2in. from the end, push the crossbar through, and secure it with a nail. Screw the eye screw in the other end of the handle, hook it through the staple, and hammer the staple into the front of the frame. Paint the truck in gay colours.



PLASTIC PINAFORES

WATERPROOF, dustproof, requiring no ironing and only a wipe with a damp cloth to clean them, the colourful plastic materials now available offer a splendid medium with which to make aprons. An article in the "Journal" for October, 1947, described how to sew these materials, and here are patterns for two aprons, one of them accompanied by a pair of protective cuffs.

Square-necked Apron

A YARD of plastic 36in. wide and 4 yards of 1in. braid are required for the square-necked apron. Lay the plastic flat and mark it out as shown in diagram below. Cut out along the thick black lines and pocket pieces. Each side of the top of the apron skirt, halfway between the edge and bib, stitch two darts, taking up 1in. of material and tapering off to nothing. Turn in a narrow hem on the side and base and stitch it with one row of stitching.

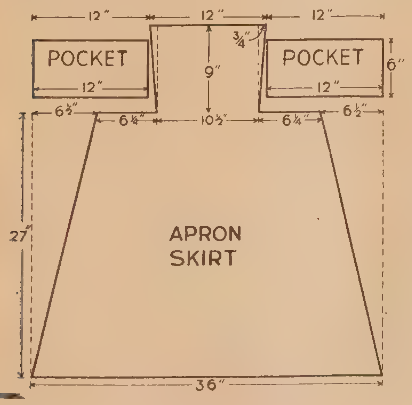
Fold one short edge of each pocket piece over at a slant, 2½in. deep down one side, and stitch along the edge with one row of stitching. Fold into 6in. pockets and stitch them on the apron, placing them near the top edge and 1in. in from the sides.

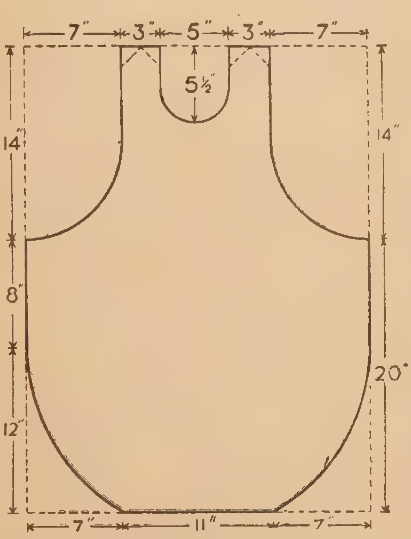
Cut a piece of braid 12in. long and stitch it across the top of the bib on the right side. Cut two 48in. lengths of braid and, starting at the base of the bib, stitch one each side, leaving extra braid at the top for ties. Find the centre of the remaining braid, place it to the centre of the waist of the apron, and stitch it across the waist to the apron edge. Fold the ends of the braid into loops through which to slip ties.

Spring-cleaning Set

The apron and a pair of cuffs require one yard of 36in. plastic, about 12 yards of binding, and 1 yard of elastic.

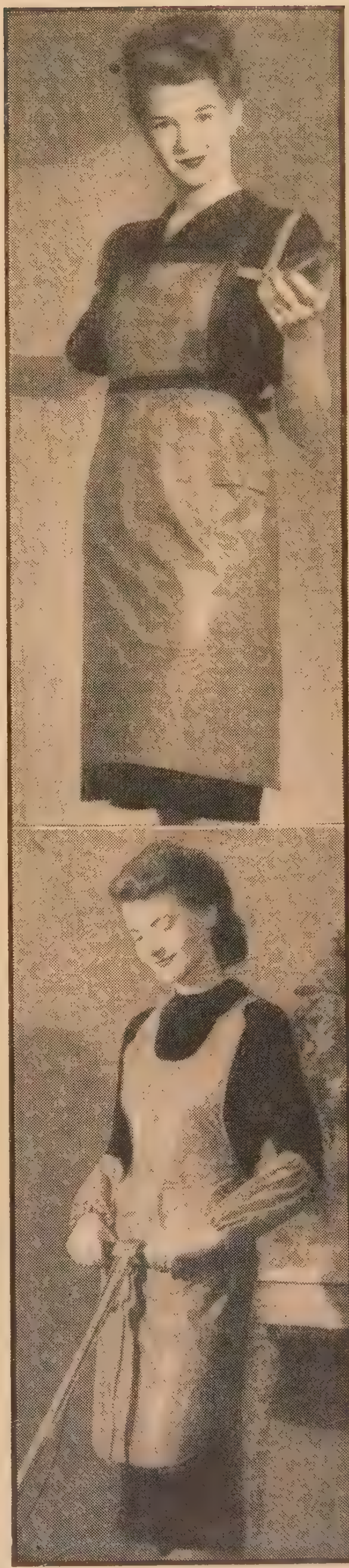
Make a paper pattern to the dimensions in diagram in middle column, lay it on the plastic, and cut out. Also cut out two plastic ties 25in. by 1in. and a pocket piece 5½in. square. Point the apron straps by the dotted lines. Bind all the edges of the apron by sandwiching the plastic between the binding so that only one row of stitching is required. Round off two corners on the lower edge of the pocket piece, bind the edges, and stitch it to the left side of the apron, taking care not to stitch over the row of stitching on the binding. Catch a scrap of binding in at each corner on the wrong side to prevent the stitches tearing the plastic. Tie the ends of the threads to fasten off securely instead of double stitching in the usual way.



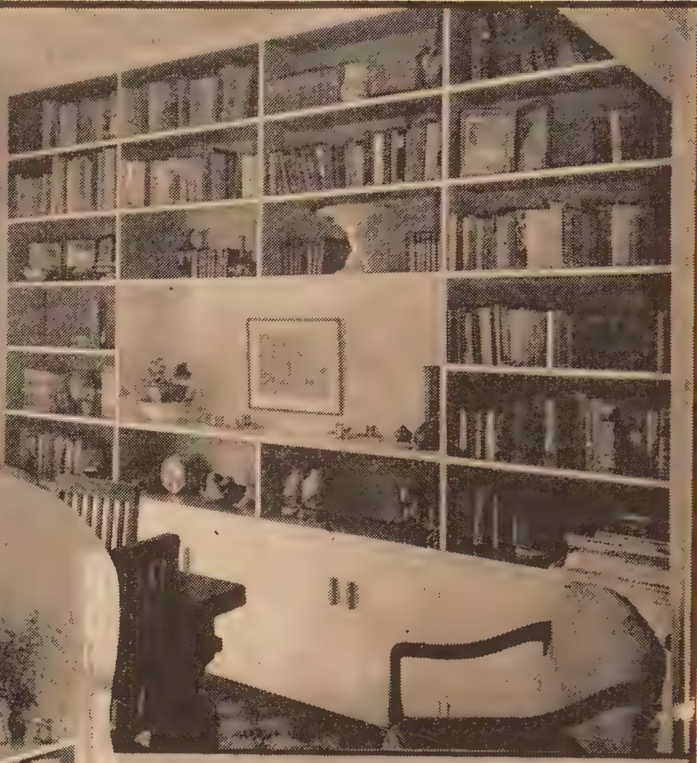


Bind the long edges of the apron ties. Fold one end of each tie in 1in. and stitch them to the wrong sides of the apron straps. Point the other ends, and attach a short length of binding for tying the plastic strings. Cut a scrap of binding off each end and stitch them across the side corners of the apron to pull the ties through when fastening.

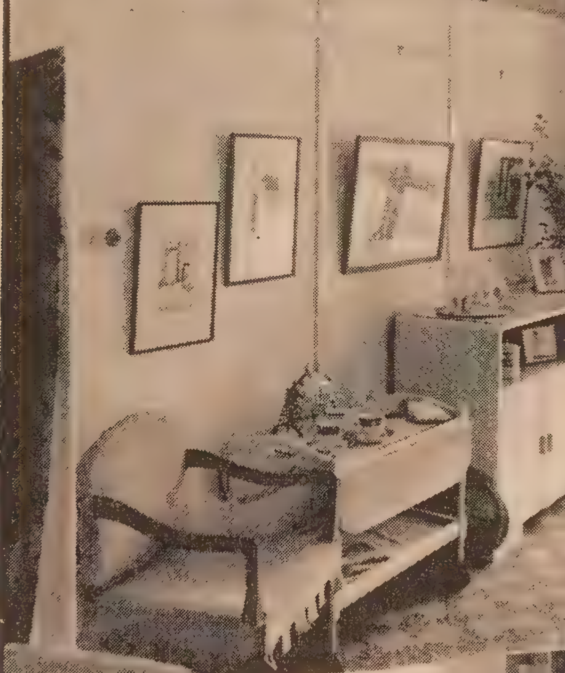
The cuffs can be made in two sizes to reach either above or below the elbow. For the longer cuffs cut two pieces 14in. wide by 11in. long and for the shorter cuffs two pieces 14in. by 9in. Stitch a strip of binding on the right side down the centre of each cuff. Join the short sides, flatten the seam, and stitch binding down on the right side to match the other strip. Take a small turning on the right side at the top and lower edges, and face these edges on the right side with binding. Thread elastic through the facings at the top and lower edges to make the cuffs fit.



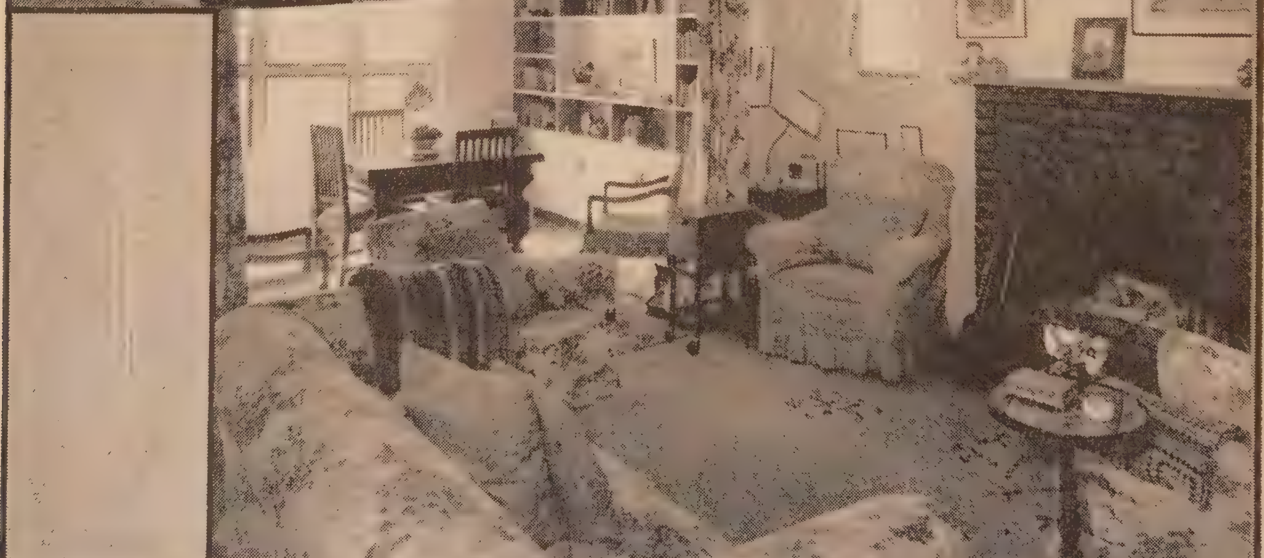
NEW ROOMS FOR OLD



Right—New storage space built to fill one wall of the dining room. If desired, the cupboards can be made 6in. wider than the shelves, making possible the use of the part nearest the window as a writing table. As well as the decorative effect of the pattern of horizontal lines, there is such effective accommodation for the family treasures that they all lend beauty to the room.



Left—The side of the dining room opposite the storage wall. The sideboard is small, with horizontal lines prevailing. The view of the whole room below shows the success of the alterations, which have given a sense of spaciousness and the maximum of sun and light to the living rooms.



Adapting a House to the Needs of the Family

By **DOROTHY JOHNSON,** *Rural Sociologist, Christchurch.*

A HOUSE for every family designed to meet its own special needs and way of life would be the architectural ideal, but the homes of at least nine-tenths of New Zealanders do not reach that ideal. The people must either alter their way of life to suit the house in which they find themselves or alter the house to come nearer to the pattern of living they desire. Even the perfect house has only a short life of perfection because families, and therefore their needs, are always changing. Adaptations and alterations become necessary sooner or later.

THERE must be hundreds of farm families who are "making do" in the old house or cottage that is part of the farm, hoping to build in the near future. Some decide to do nothing to improve the present situation, but concentrate on plans and hopes for a new house; others make some amazingly-good changes by altering the internal planning, with or without external additions.

Of the common difficulties met with in many old houses, lack of light and sun or their presence in the wrong places comes first. Next, perhaps, comes lack of living space, often caused by inadequate storage for equipment, clothing, and family possessions generally. The earlier way of dealing with the problem of storage was to fill the rooms with large, cumbersome pieces of furniture (often placed diagonally across a corner), between which only tiny oases of floor space were left. Wardrobes, dressing tables, sideboards, and beds were made as high as possible, often by carved additions meant for decoration. All these high vertical lines in the rooms helped to accentuate the appearance of space being cut into small, separate pieces. Today cupboards, shelves, wardrobes, and dressing tables are built in or made in units which emphasise horizontal lines and so make for a sense of spaciousness with orderliness, as well as giving a considerable gain in floor space.

A third difficulty is the poor planning of the working areas of kitchen and laundry, necessitating much more time and labour being given to the household tasks. Paradoxically, that is often accentuated when, in the desire to improve the situation, more modern pieces of equipment are bought. The kitchen stove is replaced by an open fireplace, but the new electric stove is across the passage in the washhouse or scullery. Something similar happens when a refrigerator is bought and the farm housewife finds herself travelling to and fro endlessly. Planning is essential. In recent months articles by Norma K. Metson dealing with kitchen design and equipment have appeared in the "Journal," bringing together the successful ideas and solutions of the many New Zealand farm housewives who have contributed their knowledge and experience to the rural housing survey at present being made by the Department of Agriculture. Some valuable suggestions have also been made about planning for more light, space, and storage room in houses.

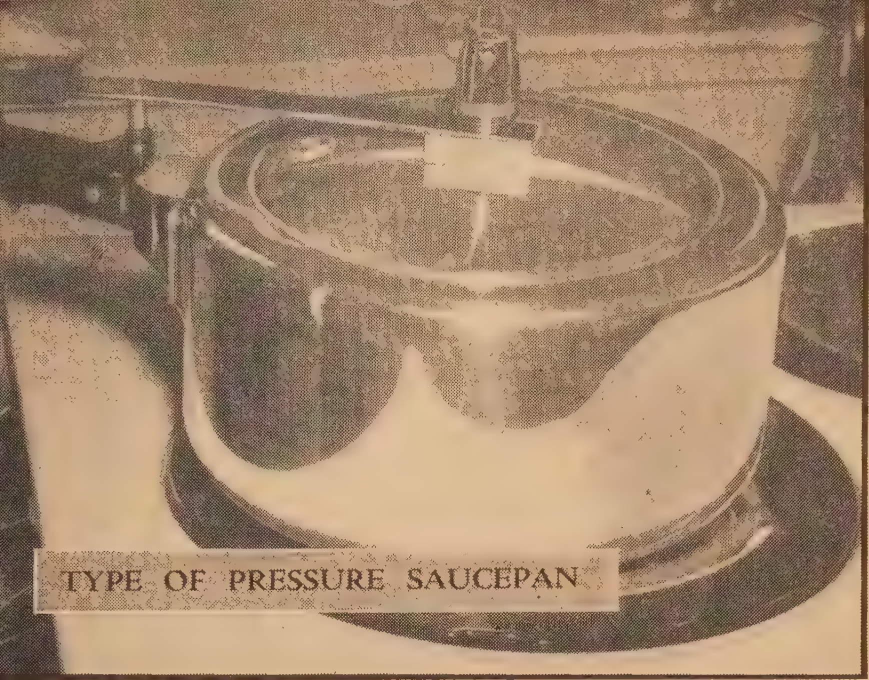
There is no doubt that often a rearrangement in the use of rooms, with some little structural alteration, the introduction of modern fittings for storage, and redecoration, will transform a house. From appearing cramped, dismal, and inconvenient, even a small house can be made light, airy, and spacious.

The illustrations of a South Island house on the opposite page demonstrate that, and show the solution of a problem which in varying forms must be that of many householders. Unfortunately no photographs of the house in its original condition are available.

The house is a small one of five rooms, two facing the road, and a side entrance on the western side to a closed sunporch which leads to the living room through french doors. The only light the living room had except the indirect light from the sunporch was from two small eastern windows, one on each side of the fireplace; one of them shows in the lower illustration. It was decided to remove most of the wall between a bedroom and the living room, turning the bedroom into the dining end of the living room; the previous dining room became a bedroom. White-lined curtains running under a wooden pelmet can separate the two rooms when warmth and cosiness are required at night in cooler weather. Three large windows face north and flood the enlarged living room with sun and light.

Storage space containing shelves for books and china and cupboards for the necessary but less ornamental equipment was built to fill one wall completely. A two-colour painting scheme was chosen, the main areas being white and the lining of the recesses formed by the shelves a deep tan, matching the flowers on the upholstery material. The sideboard and tea wagon were painted similarly to balance the storage wall fittings. To obtain the full effect of the light from the windows there are no curtains and the blinds are white.

This is a type of modern interior planning that conveys valuable suggestions to those who wish to renovate and remodel their homes, not only increasing the living space and light but storing their accumulated possessions in such a way that they heighten the decorative value of the living rooms.



TYPE OF PRESSURE SAUCEPAN

QUICK AND VARIED COOKING

By EVA TOPPING,
Rural Sociologist, Auckland.

THERE is nothing new about cooking under steam pressure at temperatures above boiling point; commercially-prepared foods have been processed in this way for many years. The new development is the pressure saucepan adapted for everyday household use; it is easy and convenient to handle, saves time and fuel and should prove a boon to the country housewife.

Pressure saucepans on the market at present are made of heavy-gauge aluminium. The style of the lid varies with different makes, but the working principle is the same. Compressed steam is raised from a small quantity of water placed in the pan and is imprisoned by a clamp lid with rubber gasket or sealing ring, so raising the pressure. Heat is thus forced through the food, cooking it more quickly than by the usual methods. The pressure control valve allows surplus steam to escape and there is also an additional safety valve in the lid. As the steam remains active and does not condense on the food, flavours are not transferred from one sort of food to another when several varieties are cooked together. Pressure saucepans are safe to use, but if the manufacturers' directions are not carefully followed, damage may be done to the saucepan.

FOODS SUITABLE FOR PRESSURE COOKING

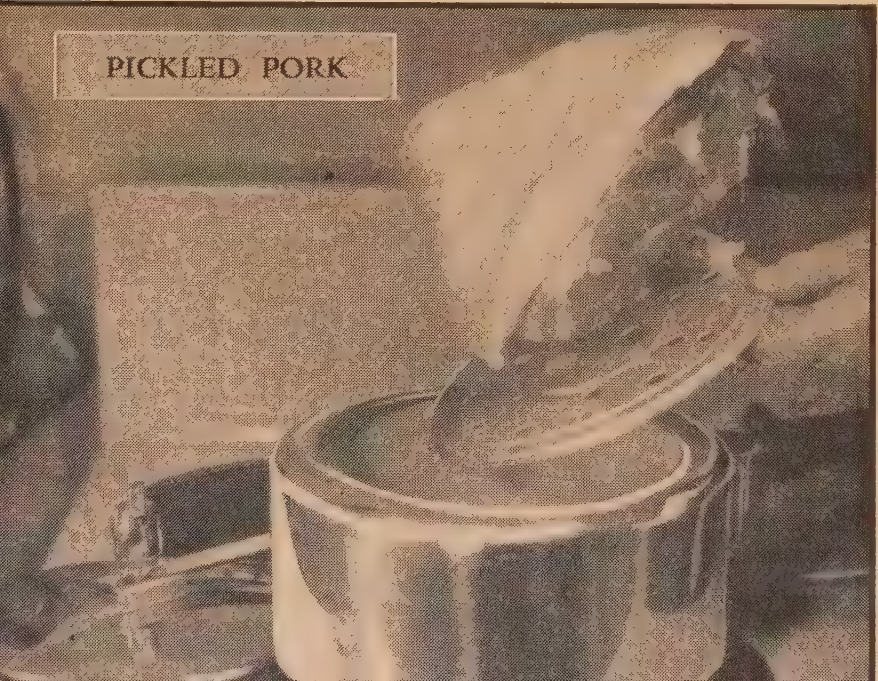
Foods which take long cooking at normal temperatures—ham, boiling bacon, ox tongues, pickled pork, corned beef, and boiled leg of mutton, for instance—are particularly suited for cooking by pressure. Tough meats are made more tender in the short time they are in the pressure saucepan than by the usual long slow-cooking method. Stewing beef is tender after 15 to 30 minutes' pressure cooking (according to the cut of beef and the size of the pieces) and is better in flavour and texture than after the usual 2½ to 3 hours' simmering. Old fowls, which are often tough even after 3 to 4 hours' boiling or steaming, are tender and delicious in 30 to 40 minutes. Chops, steaks, liver, kidneys, thin cuts of meat, lamb stews, and similar dishes are cooked in a few minutes, while a pot roast of beef requires only 8 to 10 minutes for each pound weight. The pressure saucepan will not roast beef in the same way as an oven, and chops or steaks cooked in it are braised and not fried or grilled.

Soups

Soups can be prepared quickly in this type of saucepan, most kinds taking only a quarter of the time needed in an ordinary pan. More liquid is used in making soup than for pressure cooking any other kind of food. More compressed steam is formed and so more room must be left for it in the saucepan, which may therefore be only half filled.

Cereals

Cooking times for cereals are cut down drastically when a pressure saucepan is used; 1 cup of oatmeal and 3 cups of water are cooked in 20 to 25 minutes—no more overnight soaking or long cooking for porridge for winter breakfasts! Macaroni and semolina are cooked under pressure in 5 to 7 minutes and rice in 10 minutes. As these foods are frothy



PICKLED PORK

IN A PRESSURE SAUCEPAN

when cooking, they may clog the pressure control valve vent, and to avoid this the saucepan should not be quite two-thirds full. The water (or milk) is brought to boiling point slowly, and then the cereal and salt are added slowly while stirring. Fine cereals should be blended in a small amount of cold liquid before adding to the boiling liquid in the saucepan.

Steamed Puddings, Baking Powder Breads

Steamed puddings for which the recipes advise "steam 2½ to 3 hours" will cook in less than an hour in the pressure saucepan. If suet puddings are entirely cooked under pressure, the texture is closer than when cooked by ordinary methods; this "heaviness" can be avoided by steaming without pressure for the first 15 minutes to give the mixture time to fluff up. Pressure is then raised and the pudding will be ready in a further 20 to 30 minutes. Steamed puddings made with breadcrumbs or with eggs and fats other than suet do not need the preliminary steaming and are quickly cooked by pressure, some mixtures taking only 10 minutes. "Baked" custards cooked in a pressure saucepan are ready to serve in 4 minutes after pressure is raised. Baking powder breads are other items which are speedily and successfully cooked in the pressure saucepan. Cooked in a closely-covered tin, they also should be steamed for a short while without pressure and then finished off with pressure raised.

Dried Fruits and Vegetables

Dried apples, apricots, and other fruits are prepared in the usual way by washing and soaking overnight; then they are cooked for a few minutes, varying from 1½ minutes for apricots to 10 minutes for prunes, according to the kind of fruit. Sugar is added after cooking, and for most tastes less sugar is required than when ordinary cooking methods are employed.

ALL KINDS OF VEGETABLES

Dried beans and peas can be cooked to perfection in 25 to 30 minutes after soaking. Overnight soaking is preferable, but one hour is sufficient if more convenient. Baked bean dishes are more tender and better flavoured when prepared in these new saucepans.

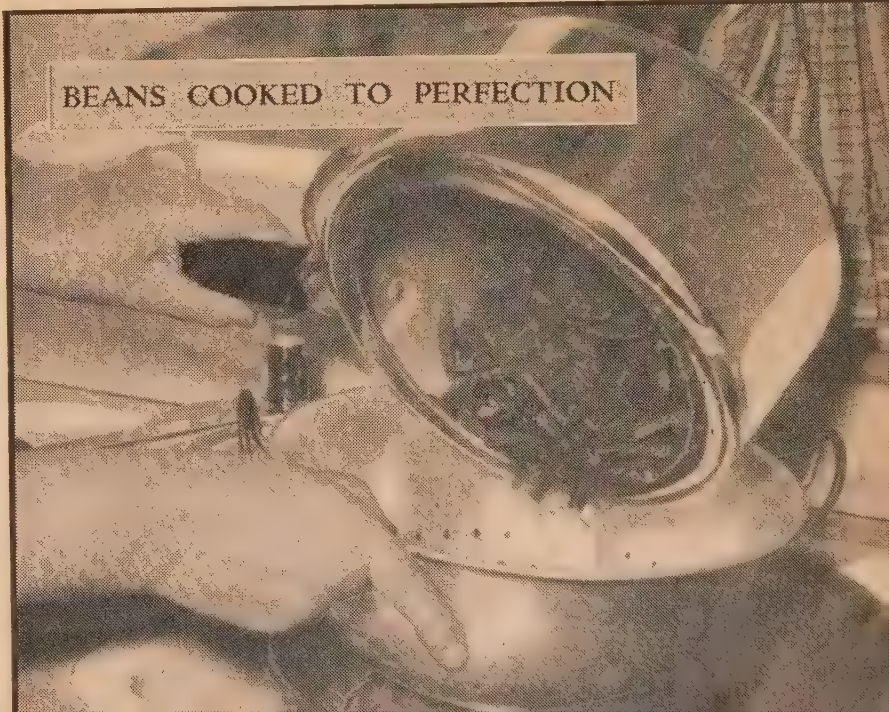
Fresh Vegetables

All kinds of vegetables are suitable for pressure saucepan cooking. They retain their fresh flavours and bright colours, provided they are not overcooked. The cooking times for vegetables are so much reduced that there is a tendency to overcook when a pressure saucepan is first used; even one minute will make all the difference between tender, crisp vegetables and soft pulp. Very little water is required and much less than the usual amount of salt, so that using all the vegetable water in gravy or sauce is an easy proposition.

Vegetables with similar cooking times can be pressure steamed together; for instance, onions, potatoes, carrots, and turnips may quite well go in the saucepan together and are cooked in 10 minutes after pressure is raised. Peas, beans, and tomatoes cook well together too, and as they take only 1 minute's pressure cooking, their total time in the pressure saucepan is very short.

Meat and Vegetables Cooked Together

The entire meat and vegetable course can be cooked in the pressure sauce-



BEANS COOKED TO PERFECTION

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HOW TO USE PRESSURE SAUCEPAN

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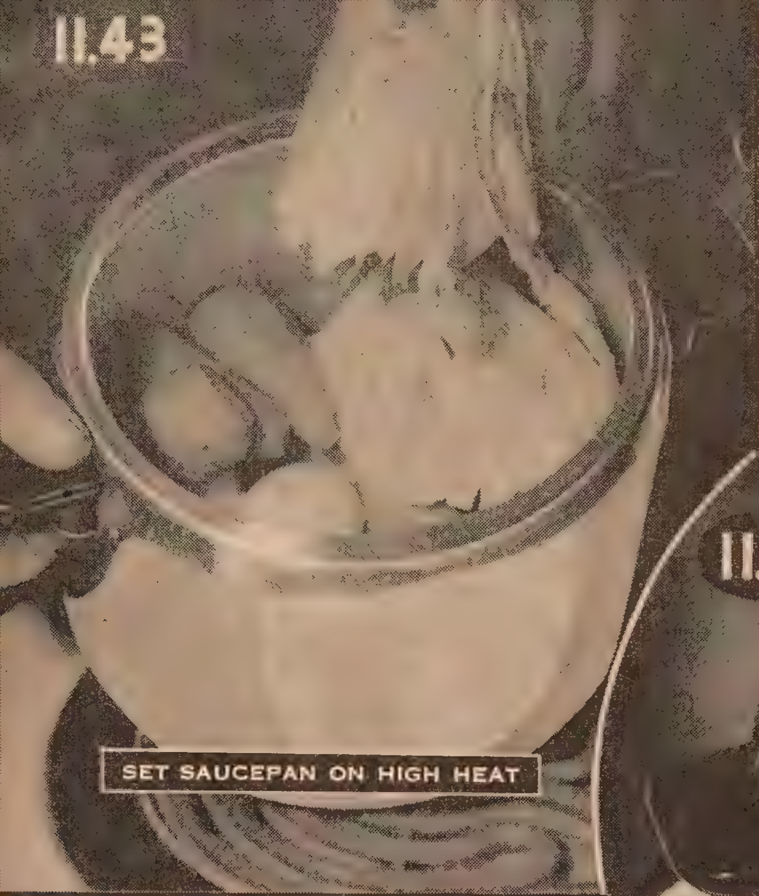

SET SAUCEPAN ON HIGH HEAT

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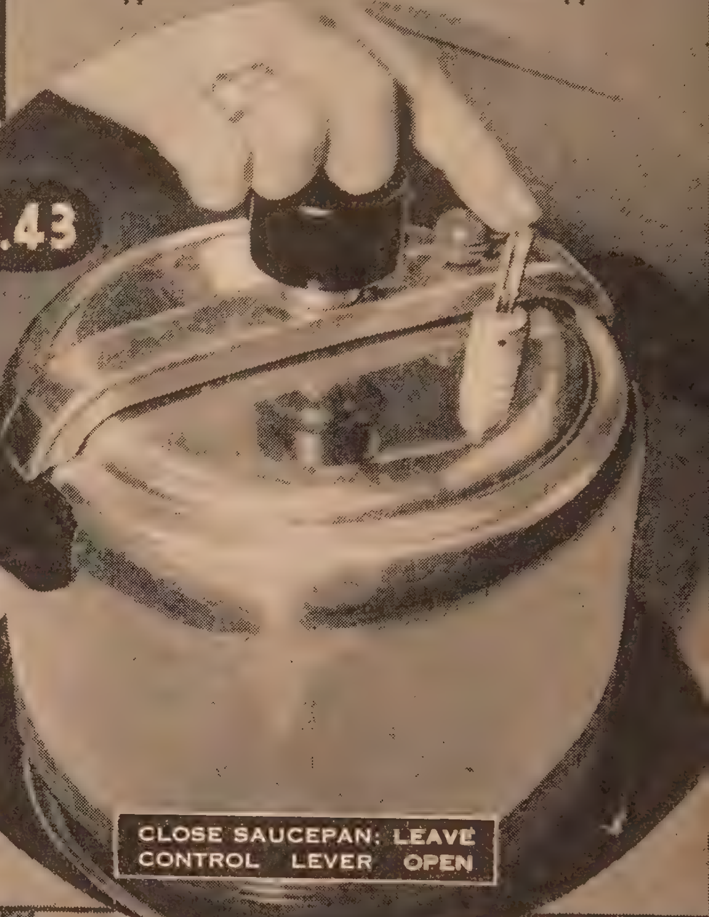

CLOSE SAUCEPAN: LEAVE CONTROL LEVER OPEN

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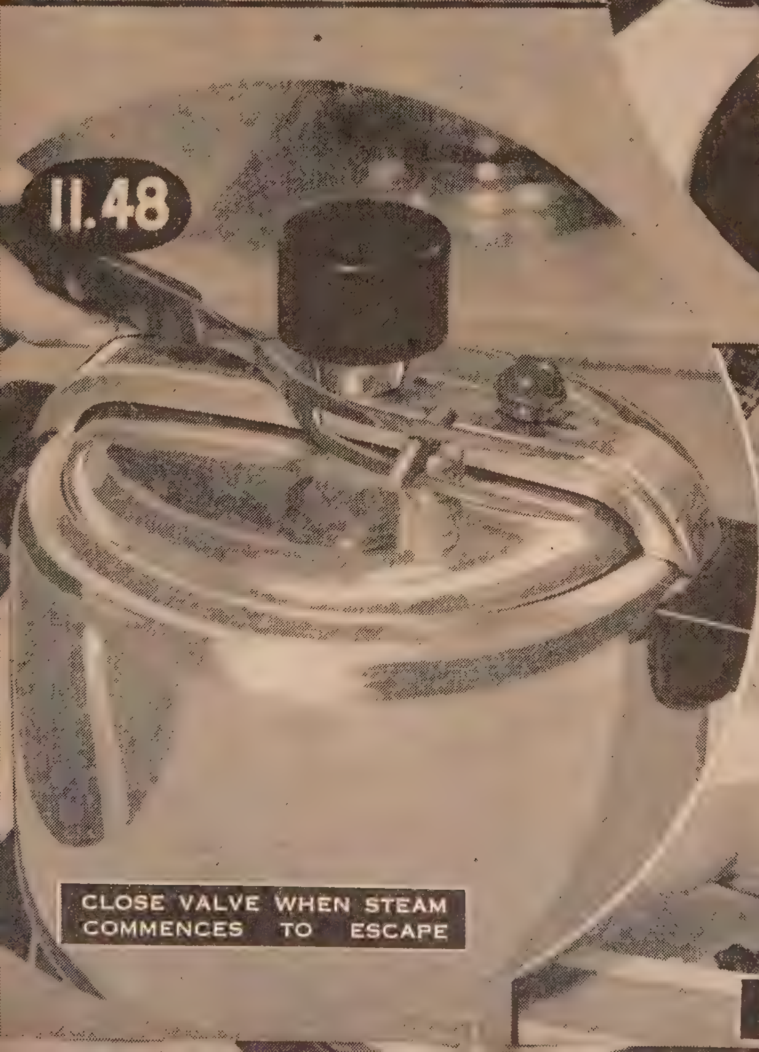

CLOSE VALVE WHEN STEAM COMMENCES TO ESCAPE

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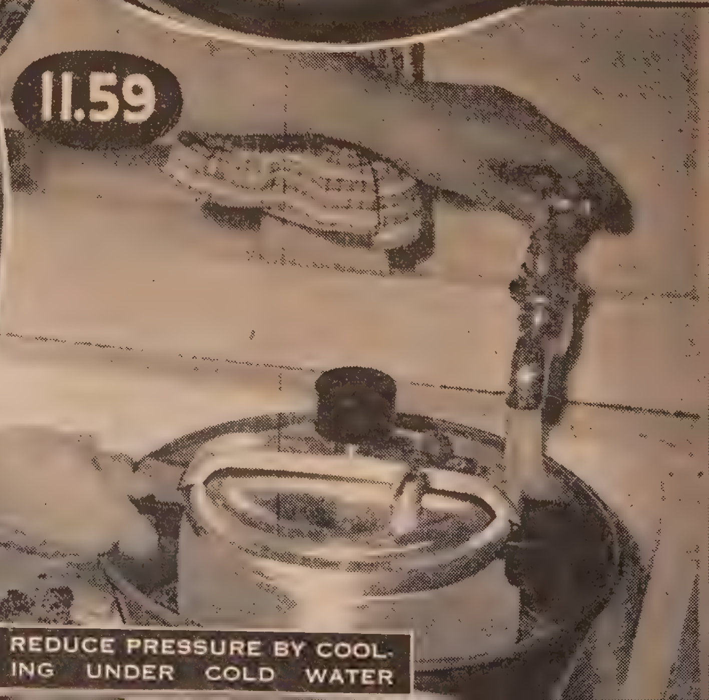
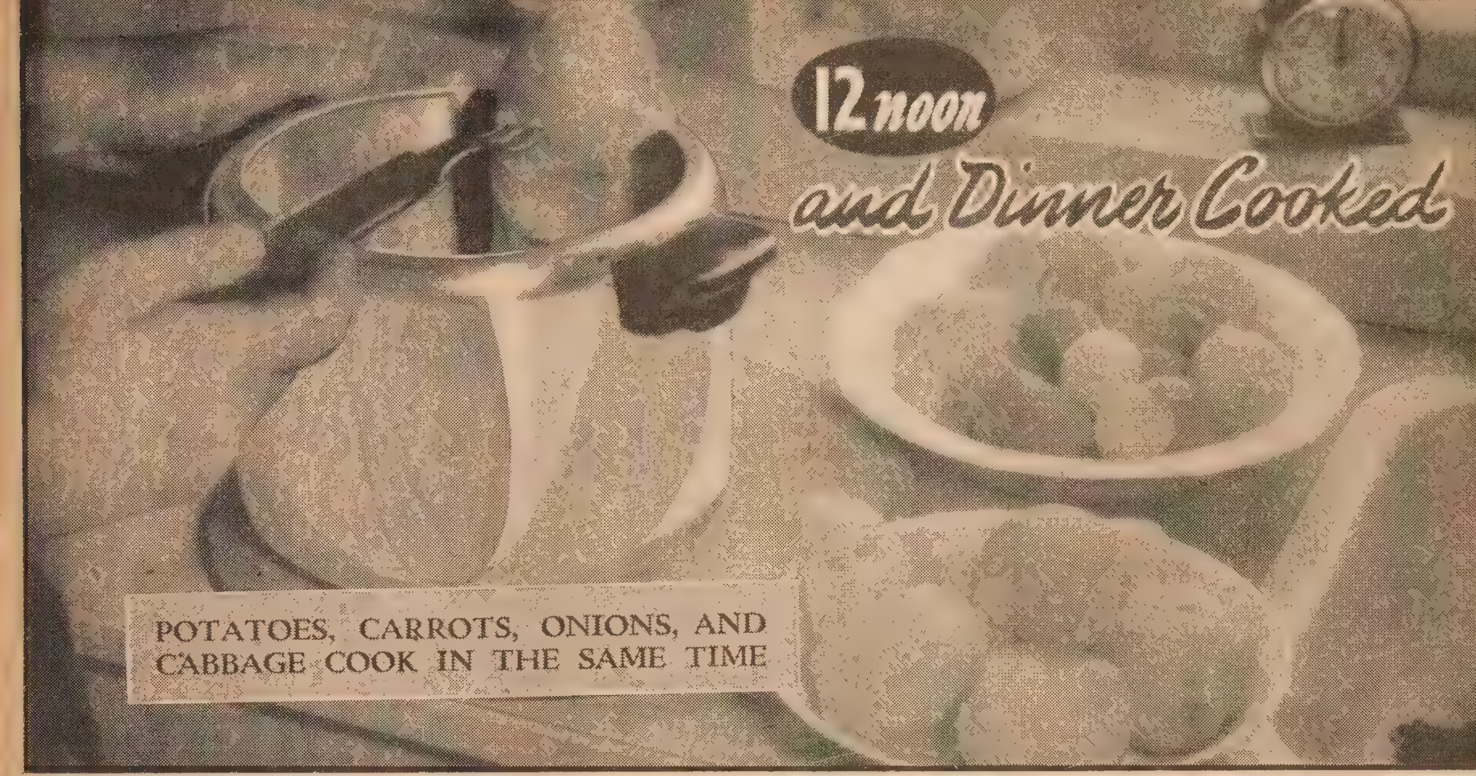


REDUCE PRESSURE BY COOLING UNDER COLD WATER

12 noon and Dinner Cooked



POTATOES, CARROTS, ONIONS, AND CABBAGE COOK IN THE SAME TIME

pan, so saving fuel and time, and also the work of washing up pots. The meat is put into the saucepan and browned in hot dripping; salt, pepper, other seasonings, and water are added and the cover clamped on. The meat is then cooked under pressure for the required time **less** the time needed for the chosen vegetables. Pressure is then reduced, the saucepan opened, and the mixed vegetables added; pressure is raised for the second time and the cooking time for vegetables counted. Pressure is reduced again and the meat and vegetables are put into a serving dish. The gravy is thickened by using the pressure saucepan without the lid. Pot roast, stewing beef or mutton, and stuffed meat rolls are all suitable for cooking in this way. Sausages and minced meat require a shorter time to cook, so the vegetables and meat can be started together and dinner will be quickly prepared. The vegetables should, of course, have approximately the same cooking times, or be cut into pieces to make them similar.

How to Use the Saucepan

Foods for pressure cooking are prepared in the usual way and then put into the pan with the correct amount of water. Most manufacturers supply tables giving the necessary amount of water and the new cooking times for the more-frequently-used foodstuffs.

Set the cover in position according to the manufacturers' directions (they vary with different brands of cookers); put the saucepan over **high** heat with the pressure valve **open** to expel the air. Steam now starts to form and when it issues from the pressure control valve, **close** the valve with fingers or a fork. Pressure is then built up, shown by the rise of the indicator or the escape of steam from the valve in a steady, hissing stream. Now turn the heat down (or draw the saucepan to a cooler part of the range) and start to count the cooking time. The correct amount of heat will maintain a steady pressure and an occasional wisp of steam will float from the valve. Too much steam means that the heat is too high; the water may then become evaporated and damage will be done to the cooker. If no wisps of steam emerge, the heat is not high enough to keep up the pressure and the contents of the saucepan will not be cooked in the stipulated time.

When the food has been cooking for the required time remove the saucepan from the heat and reduce the pressure by running cold water over the sides and bottom. Open the pressure control and then take off the cover.

Never open the pressure saucepan before cooling it and always make sure the pressure control valve is open.

From these directions it will be noticed that there are four stages in pressure cooking.

1. Expelling the air—by setting the closed saucepan over **high** heat with pressure control valve **open** until steam emerges.

2. Raising the pressure—by closing the valve and maintaining high heat until steam emerges in a steady, hissing stream or the indicator shows that the correct pressure has been reached.

3. Cooking—with valve closed and heat turned **low** so that the correct pressure is maintained and only an occasional puff of steam emerges from the valve.

4. Reducing pressure—by running cold water over sides of saucepan.

Care and Cleaning of Pressure Saucepan

Keep the saucepan clean and bright, but do not use gritty or scratchy cleansers, soda, or strong soap powders. Pay special attention to the pressure control valve and always run hot water through it after use. Pressure could get too high if the control valve became blocked. The rim of the cooker and the rubber ring must be kept free from particles of food or a tight seal may not be possible. Take care of the cover, as it is the important part of the cooker; if it becomes dented or warped it will not make a steam-tight seal. Similarly, if the rim of the saucepan is knocked or dented, steam will escape. Remove food stains with soft cleansing paste, cream of tartar, or a cut lemon. Put the saucepan away with the cover resting on top, and not locked, and leave the valve open.

Never open the saucepan when the pressure control valve is closed and never more than two-thirds fill the pan and only half fill it for soups.

Tables of cooking times for various foods are supplied with the saucepans and vary with different makes. At first instructions should be rigidly adhered to; later on, when a little experience has been gained, the cooking times can be altered slightly to conform with the family preferences for well-cooked or lightly-cooked foods.

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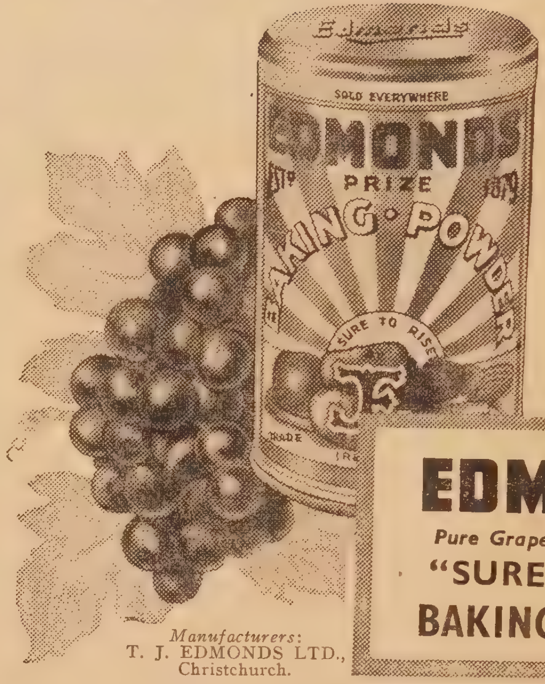

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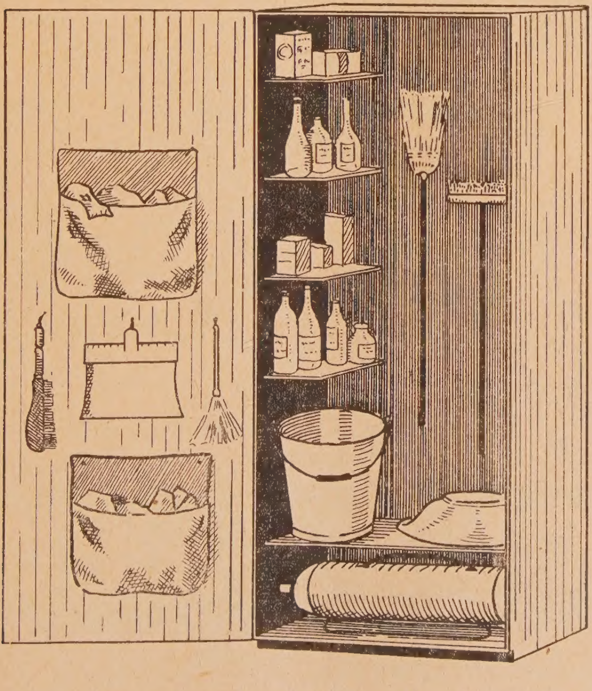
Kitchen Facilities

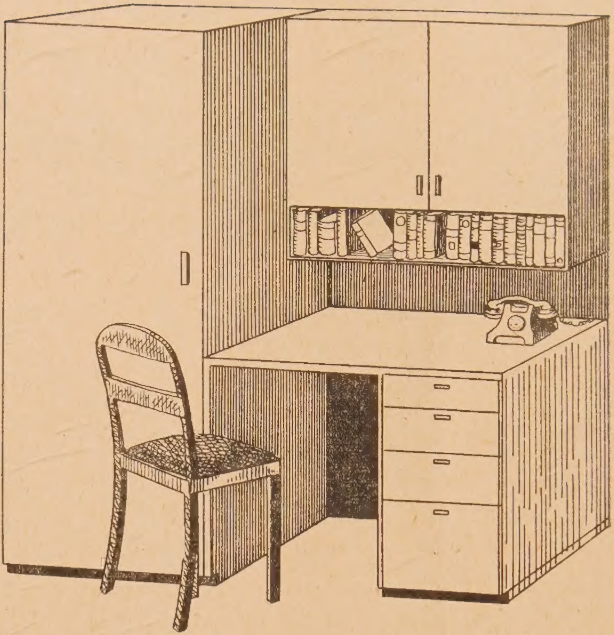
THE arrangement of kitchen work around the three main pieces of equipment, stove, sink, and refrigerator, has been discussed in previous articles by Norma K. Metson, Rural Sociologist, Wellington. In this article she deals with the provision of additional facilities in the kitchen for other work the housewife requires to do.

THOUGH most of the work done in the kitchen will be done at the stove, sink, and refrigerator—indeed, there may be no other equipment in the room—many farm kitchens are large and need provision for a number of other activities. These may include ironing, children's play, the housewife's managerial work, serving meals, sewing, and a considerable amount of social life. Extra facilities may be worked into the general scheme or confined to one end of the kitchen and separated from the remainder of the room by a 4ft. or 5ft. partition of cupboards or a ceiling-high storage wall. Other modern plans include what is really another room next to the kitchen work area and not completely divided from it. This area may be arranged as laundry, utility room, or dining room, depending on its location and the needs of the family.

When plenty of working bench space is provided at the sink, mixing centre, and stove the kitchen dining table will not need to be used for baking and serving, and so will not be overburdened if it is made to serve for a few additional tasks where a large working surface is an asset. If no dining table is included in the kitchen, a small utility table about 2ft. x 3ft. will be necessary. It is an advantage if this table is on castors and light enough to be easily moved.



Arrangement for cleaning cupboard.



Arrangement for planning centre.

Broom and Cleaning Cupboard

Housewives frequently prefer the broom and cleaning cupboard to be in the laundry or passage rather than in the kitchen, where it may take up space which would be more useful in other ways. The location chosen, however, should not be an obscure corner; it must be easily accessible from all parts of the house, especially the service areas. Brooms, brushes, dusters, cleaning supplies, and equipment are kept there, and it is usually wise not to include other items such as ironing board or aprons, as the smells of kerosene, floor polish, and ammonia are penetrating and persistent. A full-length cupboard about 7ft. x 2ft. x 18in. to 24in. divided by a low shelf 12in. to 15in. from the base is needed. This provides a separate compartment for the vacuum cleaner, a difficult item which for lack of storage space is often kept behind a door, under a bed, or on a wardrobe floor. A set of shelves to hold bottles and tins should be fitted on one wall and should be 8in. to 9in. wide and graduated for height, the lowest shelf being about 18in. up so that a bucket can be stored beneath. Shelves should be set back 4in. to allow for articles hung on the back of the door. Brooms and mops wear out more quickly if they are left resting on their bristles when not in use, so they should be hung upside down on hooks or blocks on the other two walls. This also prevents the danger of leaning articles falling out when the cupboard is opened. Space can also be found there or on the back of the door for hooks for the dust pan, whisk and hearth brushes, dusters in use, and perhaps one or two handy tools such as a hammer and a screwdriver. Two or three flat bags on the back of the door will keep dusters tidy and easily accessible.

Planning Centre

The farm kitchen sometimes has a place used as the farm office, but seldom one where the housewife can keep her records and recipes. Of course many homemakers neither need nor desire such a centre, but others who delight in collecting recipes and ideas, who take a pride in keeping accurate accounts, or who have always longed to be able to sit down and write to "Mary" without leaving the kitchen and searching the house for pen and paper will find it a great convenience. A surface 3ft. x 1ft. 9in. is ample, with drawers down one side and a bookshelf and cupboard above. The shelf will hold the recipe books and file and the small booklets of instructions which come with new pieces of equipment and are so easily mislaid. Pens, ink, and writing supplies go in one shallow drawer, account and record books in another, brown paper and string in a third, and the deep drawer at the bottom could be used for filing magazines and clippings pasted on paper and kept in folders. The top cupboard is an ideal place for the kitchen first-aid kit. Good lighting is essential, and this centre must not be regarded as a way of filling in an odd dark corner. When telephones and extensions are again readily available an installation there would save many steps and missed calls.

Ironing

Unless the laundry is specially equipped, ironing is generally transferred to some other room, as it is "clean" work and the housewife may like to listen to the wireless or talk to the family as she works. Facilities required are the ironing surface, space to sort and stack clothes before and after ironing, and a wall-hook for coat-hangers. The power plug for the iron should be on the right-hand side of the work surface, as this prevents the cord from getting in the way. Some prefer a table to iron on, others a board of the collapsible or built-in type. If the table is used mainly, a portable board is necessary for a satisfactory finish to garments such as pleated skirts. Folding boards are space saving and can be set up anywhere, but it is difficult to find one steady enough for heavy work. The ordinary table tends to be low for ironing, and the stooping necessary when reaching across it is tiring. To find a comfortable working height stand erect, with the arms slightly bent and the palms parallel to the floor. The position of the hands will indicate the desirable height, which is usually about 34in. to 36in. Some folding boards are adjustable for height or can be obtained in two or three sizes; a built-in board will need to be fixed carefully at the correct level. Sitting down to iron is not the mark of a lazy or inefficient worker; it is a very sensible habit. A kitchen stool gives support and sufficient height, and only a small proportion of the articles need the extra pressure of standing.

Sewing

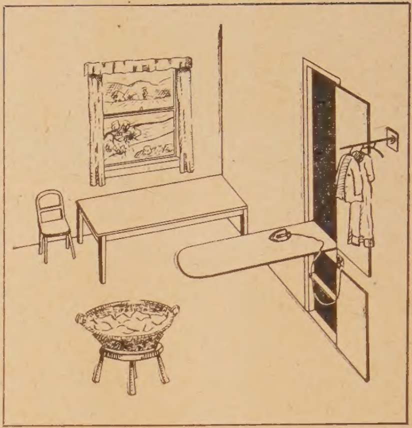
The convenience of the iron and table for cutting near at hand are reasons why many people like to sew in the kitchen if they cannot have that near-necessity, a sewing room. A sewing alcove, described in the September, 1946, issue of the "Journal," could well be fitted into the kitchen cupboard arrangement. With full-length doors, necessary untidiness can be shut away at any time, and a lock will keep small, inquisitive fingers away from the fascinating variety of articles in the drawers and pigeonholes.

"Children's Corner"

Small children especially will spend a great deal of time in the kitchen. A recent American magazine showed a beautifully-planned kitchen for a mother and in an alcove a minature replica with stove, refrigerator, pots, and dishes for a small daughter. Such extravagance can be only for the few, but a "children's corner" in the kitchen is a help to a busy mother. A drawer, cupboard, or shelf for a few toys when pot lids and the egg-beater have temporarily lost their fascination, a low table and chair for meals and quiet games, and a piece of blackboard for scribbling do not take much room and will help to keep toddlers happy and out of the way when they have to stay indoors. Older children may find the planning desk useful for homework or hobbies.

Social Centre

To many, a farm kitchen is not complete without a couch, an old roomy one where mother can relax for a few minutes, father can stretch out with the paper, a convalescent child can be kept warm and happy, or a visitor can sit in comfort. Indeed, there are few hours of the day when a kitchen couch is not in use, but space for this traditional object is not easy to find in today's cramped quarters. A modern alternative is a long built-in seat with storage space beneath and a padded or cushioned top. This can be used as a seat at meal times, and may be built out into a window bay, with useful shelves at each end.



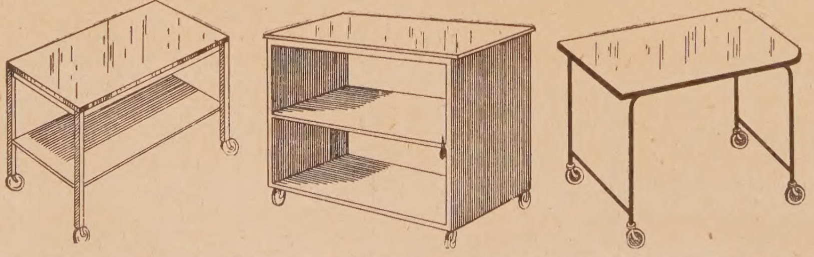
Layout for ironing equipment.

Oddments

Various small pieces of furniture add to convenience in the kitchen. A wagon or movable table is useful for setting tables, stacking dishes, or as an extra work surface. One shelf may be made to lift off as a tray. A high stool can be used when working at a bench, and a comfortable kitchen chair which will support the back and is the right height for use at table or desk is of advantage. A light but sturdy pair of kitchen steps kept handy so that it is not too much trouble to go and get them are helpful when reaching to a high cupboard. Some stool-step combinations which are quite satisfactory can be bought; others are too clumsy to be useful.

This list of activities and equipment is still not exhaustive; it could not hope to be, nor is it to be imagined that all the things suggested must be incorporated in a single room. Family needs differ, and the home-planner must make a selection from the various possibilities.

THREE TYPES OF MOVABLE TABLE



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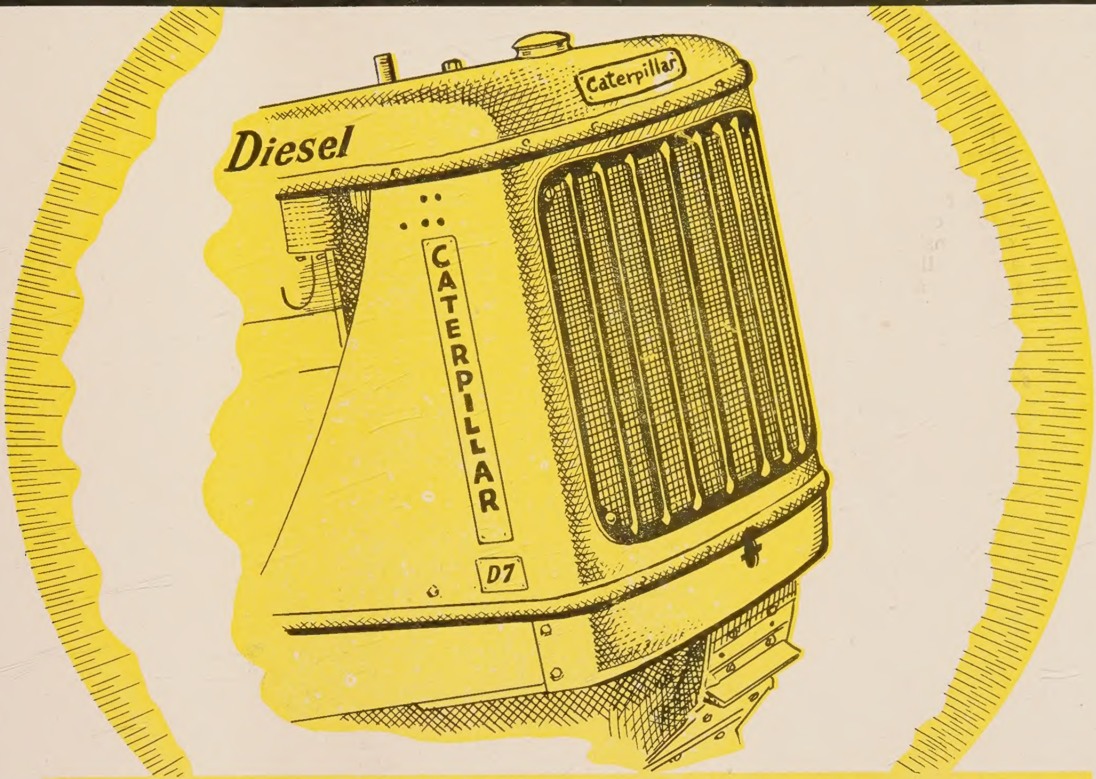

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